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BREAKDOWN: MECHANICAL DYSFUNCTION AND
ANTHROPOMORPHISM

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Metropolitan University for the degree of Doctor of Philosophy

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ABSTRACT

Breakdown: Mechanical Dysfunction and Anthropomorphism is a practice-led research project examining the role of mechanical breakdown in the anthropomorphic process. Current theoretical approaches to mechanical breakdown identify it as a homogenous, revelatory event “a sort of breach opened up by objects.” (Baudrillard, 2004: 62). *Breakdown* challenges this stereotyping and seeks to examine the range of gesture and affect that differing forms of mechanical breakdown exhibit. In doing so it also develops Sherry Turkle’s notion of anthropomorphism as a connective rather than ascriptive process (2005: 351) in the light of Karen Barad’s “performative account of material bodies” (2007: 139).

Leading this research is *Breakdown*, the making, remaking, exhibition and re-exhibition of 36 *breaking-machines*. These *breaking-machines*; simple mechanical devices made from reconfigured found materials; approach breakdown and fail during their exhibition. They are then repaired or reconfigured by the artist ‘live’ while still on show. Throughout the research this role of the artist as repairman became a key method. The continual recombination of human and machine responding to the *call* of breakdown allowed for a more detailed understanding of the gestures of mechanical breakdown. This performative relationship considers the posthuman decentring of the Vitruvian man in the writing of Rosi Braidotti (2013: 2) and Karen Barad’s agential realism (Barad, 2007: 44) both of which insist that the human, rather than bounded and individual, be considered as part of a dispersed network of interacting parts.

The thesis begins by investigating the performative relationship of *Breakdown* in detail. It describes a machine-human body that is materialised fleetingly by mechanical dysfunction. Through an intimate relationship with one machine, it then goes on to identify a typology of breakdown: *seize*, *play*, *burnout* and *cutting loose*, concluding that each emits differing expanding and contracting forces around which bodies disperse and coalesce. Finally, employing the flicker of a thaumatrope and the making of the science fiction film robot, the thesis posits that anthropomorphism is an integral element in the dissipation and reformation of human-machine bodies.

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INTRODUCTION

In July 2017, a newspaper article circulated claiming a security robot had “committed suicide” by drowning itself in an ornamental fountain (Curtis, 2017). Although it was later discovered that the machine’s demise was accidental (a slippery floor) the story followed a trend in the reporting of robot failure¹ that connects breakdown in machines with anthropomorphism. In these reports ‘breakdown’, the ‘human’ and the ‘machine’ are vertices of a triangle that have been explored since Karel Capek’s 1921 play *RUR* and via many science fiction iterations such as Isaac Asimov’s *I Robot* (1950), John Badham’s *Short Circuit* (1986) and Andrew Stanton’s *WALL-E* (2008). In these fictions breakdown is coupled with agency, an idea introduced by Karen Barad in *Meeting the Universe Halfway* (2007) in her brief discussion of “stoppage” (Barad, 2007: 230). Here Barad was to some extent following Bruno Latour’s work on Actor-Network-Theory and prevalent theories that stereotype breakdown as a revelatory event² but fail to delve into the range of gesture and affect that breakdown covers.

While these fictional and theoretical texts explore the narrowing of an assumed gap between human and machine, the anxieties and stresses produced when *human-work* and *machine-work* overlap have also been the subject of recent studies into the increasing technification of society. Dr Kathleen Richardson’s book *An Anthropology of Robots and AI* (2015) investigates these stresses in detail tracking the robot’s evolution from the 1920s *worker-robot* to the social robots of the early twenty first century. Similarly, Susan Greenfield’s *Mind Change* (2014) looks at the impact of digital technologies on the brain. The economic and societal impacts of increased mechanisation have been foregrounded by popular writers including sociologist Peter Frase in *Four Futures: life after capitalism* (2016) and futurist Peter Ford in *The Rise of the Robots* (2015) as well as being central to Bernard Stiegler’s *Automatic Society: the future of work* (2017). In the face of these anxieties, anthropomorphic design has become a central concern of a growing robotics industry (Fink, 2012) as it struggles with the implications of Masahiro Mori’s study of the suspicion induced by near-human robots, *The Uncanny Valley*

¹ Another example is the reporting of a robot that “escaped” from its lab in Russia. Here an unidentified breakdown in programming caused the public relations robot to be ascribed with determination and a desire for freedom (Hrala, 2016).

² See for example: (Virilio, 2005:63), (Badiou, 2007: xii), (Baudrillard, 2004: 62)

(1970). While neither anthropomorphic design in robots nor the societal impacts of technification are discussed in detail in this thesis they provide an interesting backdrop for my research. This is an environment in which the boundaries of machine and human are being continually eroded and shored up.

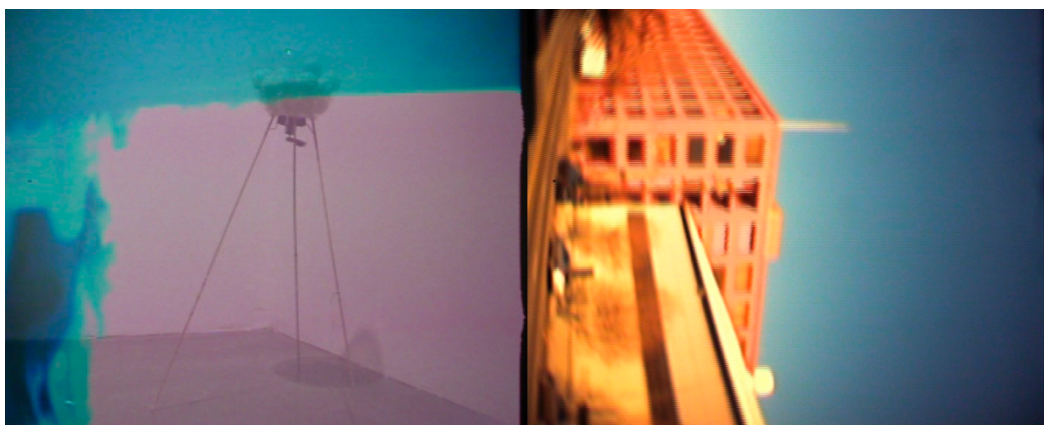
Breakdown is the body of work that leads this research. It consists of 36 machines and videos displayed in various configurations across three solo and six group exhibitions. These machines and the solo exhibitions - *Denis ex Machina* (2017) and *Love Machines* (2017) - are documented in appendix 2: Breakdown Manual. Links to video records of each show can also be found throughout the main text. The final exhibition *Breakdown*, (2018) forms my dissertation exhibition at *ELAN*, Cambridge. Throughout these exhibitions, I developed a new practice methodology that demanded a shifting relationship between myself and the machines. This was a process by which I committed myself to be present in each exhibition for significant amounts of time: repairing, altering, decommissioning and replacing the machines. Neither a performance nor an ancillary activity, this new approach to the relationship between artist and the technical art object represents a significant break from existing strategies for the exhibition of art with mechanical elements. While we all have encountered a darkened screen or stilled machine in a gallery we usually experience it in terms of the artwork's absence; its physical or notional removal from the exhibition. However, in a methodology that adds "repair" to Virilio's assertion that "function and malfunction always go together" (Broeckmann, 2017: 42) this research creates a new apparatus for gaining insights into the machine-human relationship. My thesis posits that the stereotyping of breakdown by theorists such as Karen Barad, Paul Virilio and Jean Baudrillard fails to attend to the full range of its expression and affect. Using a practice led approach, I lay out a framework for understanding the range of types of mechanical breakdown and show that each is associated with individual gestures with differing power and vectors of affect. Additionally, I theorise a re-evaluation of anthropomorphism by positing that the gestures of breakdown are a motive force in the creation and dissipation of human-machine bodies.

Machines have been a significant element of my practice since 2004 when I made a short video of an electric toothbrush wearing a floral Barbie skirt. The toothbrush, via the interacting forces of vibration and friction, “danced” through three sepia tone sequences in a manner reminiscent of a Buster Keaton film. This and other works from the same period displayed a significant anthropomorphism that was identified by audiences and critics as central to my practice. Kate MacFarlane, took this observation a step further in a catalogue entry for the group show *Drawing Links*.

Alex Pearl sets up situations, which illustrate our predicament. His short videos have the improvisational nature of the sketch. They revolve around the fate of simple creatures conjured from lollipop sticks or ping-pong balls. These creatures are set in motion through primitive actions and machines, and filmed whilst left to their fate. This fate is, of course, dictated by gravitational and other forces, plus a great deal of chance.

(MacFarlane, 2006: 2)

Here McFarlane suggests a Spinozistic³ shift in interest from the “simple creatures” to the forces that “dictate” their existence. This move is key in the making of work for this project. Although the machines made for *Breakdown* could still be characterised as “creatures”, I have made a conscious attempt to move away from anthropomorphic design to allow focus on the forces of function and dysfunction.



Two frames from *Automatic Film VII*

Baruch Spinoza described his relational understanding of bodies in his *Ethics* (1677) “A body which moves or is at rest must be determined to motion or rest by another body, which has also been determined to motion and that again by another and so on to infinity”. (Hampe, Renz and Schnepf, 2011: 124)

A second body of work also informs this research. The *Automatic Films* were a series of 30 video pieces made between 2006 and 2014. These films deployed an evolving troupe of mechanical actors in various locations. Not only did these simple robots perform for the camera, careening off each other and their surroundings, but they also played a significant role in the filming itself. Many of the machines carried miniature radio transmitting cameras whose interfering signals were collected centrally using CCTV receivers. The resulting videos were cut together from their jittery camera-work, providing a machines' eye view of the world they inhabited. Key to the manufacture of the *Automatic Films* was the idea of accidental interaction engendered by the functions and malfunctions of the mechanical actors. My own role, however, was elided. Despite my constant presence during filming and editing I cut myself out. In what Chris Clarke described as an attempt to "contract out" (Clarke, 2010) creativity I was ignoring the importance of all aspects of the apparatus that made up the *Automatic Film*. The questions of my own involvement and the role of breakdown in forming my relationship with machines were key in developing a distributed agency in the work *Breakdown*.

The theoretical basis for this research has been what has been dubbed by Richard Grusin as the *Nonhuman Turn* (2015: vii-ix). The *Nonhuman Turn*, a blanket term covering several other blankets including *New Materialism* and *Speculative Realism* "can be understood as a continuation of earlier attempts to depict a world populated not by active subjects and passive objects but by lively and essentially interactive materials, by bodies human and nonhuman" (Bennett in Grusin, 2015: 224). More specifically this research attends to theoretical approaches that seek to break down bodies entirely, decentring and dispersing the human. Key here are Karen Barad's performative theory *Agential Realism* and Catherine Malabou's *Destructive Plasticity*. These theories lead the way in breaking down causality and the boundaries of the body, shifting the emphasis towards what Barad calls "a doing, a congealing of agency" (Barad, 2007: 2010). This theoretical context of dispersal and coalescence has allowed me to position my practice as meaningfully different to existing artists working with machines. As the literature review discusses, while there is a significant ancestry of artists exploring human machine relationships. From Tinguely's *Metamatics* of the 1950s via Horn's machine sculptures to Stelarc's more recent cyborg experiments I argue the divisions between artist and

machine have been clearly made. *Breakdown* however, turns away from the idea of human and machine bodies altogether and instead concentrates on the emissions of mechanical breakdown; its grinds and pauses. This research seeks to replace the boundaries and definition of the binary relationship between human and machine with haziness and unbalance, a methodology that responds to Barad and Malabou's performative theories.

Due to the constraints of producing a focussed thesis this research does not tackle the involvement of gender in the anthropomorphising of machines. The common designation of transport machines as female, or the briefest of examinations of Fritz Lang's *Metropolis* (1927) or Bryan Forbes' *Stepford Wives* (1975) for example, reveals the involvement of gendered anthropomorphism in a project of control, what Jacques Derrida calls "anthropomorphic taming" (Derrida, 2008: 37). As Rosi Braidotti asserts in *Metamorphoses: Towards a Materialist Theory of Becoming* (2002):

The technological or mechanical other is libidinally charged in that it represents a connection, a link or an in-between. Such transition zones are heavily genderized.

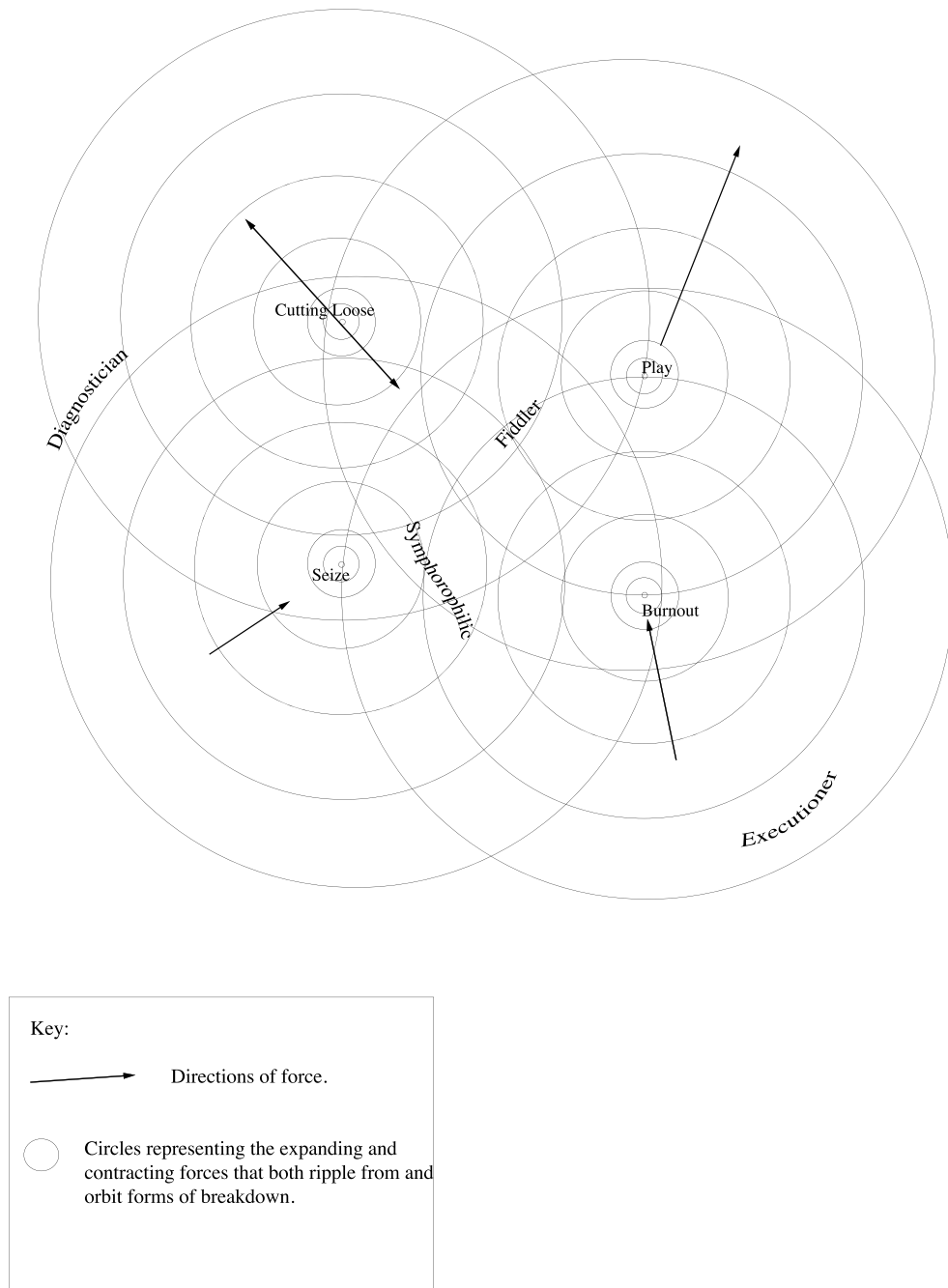
(Braidotti, 2012)

Braidotti's book examines many of the same science fiction sources referred to in this research articulately drawing out the marks of sexual difference they bear. Karen Barad also provides a re-evaluation of Judith Butler's theories of the performativity of gender in *Meeting the Universe Halfway* (2012) noting the boundary making practices at work in the use of foetal ultrasound imaging (Barad, 2012: 193-4). The gendering of machines and the involvement of the technical object in the processes of gendering are clearly important parts of the anthropomorphic process and are recognised in Chapter Three in the discussion of the first Niagara Falls barrel rider Annie Edson Taylor and of the science fiction robot. However, the focus my thesis rests on the mechanisms of change impelled by specific types of mechanical breakdown.

Neither does this research provide any neologisms, however, in keeping with its practice methodology, it repurposes several words to describe the phenomena discussed. Chiefly these are *Juncture*, *Paramorphism* and *Linkage*. While they are explained within the text, a separate glossary (appendix 1) is provided to expand upon their definition and to explain some technical mechanical terms.

The main body of the thesis is divided into three chapters. An unstable and fluctuating definition of *Machine* is presented in Chapter One. Here “the machines of *Breakdown*” a phrase that refers to the 36 machines made for this research, are defined as different forms of *breaking-machine*; technical objects at odds with Gilbert Simondon’s negentropic definition of the machine (Simondon, 1958: 9). Breakdown is discussed in Chapter Two, here I refer primarily to mechanical breakdown, a shift away from ideal function in the mechanical object. Breakdown is not necessarily as final as failure (the total cessation of function, see glossary) nor as fleeting as the break-in-flow that is the glitch (Menkman, 2011: 9). Nor, the chapter argues, should breakdown be viewed as a homogenous event but rather through a detailed examination of the faltering missteps of the machines of *Breakdown* it discovers a broad typology of events: *Play*, *The Seize*, *Burnout* and *Cutting Loose* each having its own tendencies and language of expression. Chapter Three takes anthropomorphism, the ascription of human qualities onto the nonhuman, and using: an abortive attempt to dress up as a robot, a Victorian proto-cinematic toy and *Silent Running*’s (1972) Huey, Louie and Dewey re-defines it as a multifarious signalling, embodying and disembodying force.

Diagram showing a typical set of relationships between types of breakdown and the performative roles adopted during this research.



METHODOLOGY

- i. Practice Methods, The *Making of* and The *Breaking–Machine*
- ii. The Speculative Machine
- iii. Whitehead’s Speculative Methodology
 - a. Failure
 - b. Connectedness
- iv. The Decentred Researcher

i. Practice Methods, *The Making of* and the *Breaking-Machine*

To explore the question “What does *Breakdown* reveal about the anthropomorphic relationship between humans and machines?”, the machines of *Breakdown* are largely concerned with the production of the illusion of breakdown and with the documenting of both this illusion and its mechanics. These mechanics are, in turn, also subject to ‘real’ breakdowns that entangle them with the illusions they produce. This process employs the methods of the *Making of* documentary, a genre of film closely linked with science fiction cinema⁴. Typically, this form of documentary intercuts scenes from the original film with footage of the struggle involved in bringing them about. Because of its close relationship with the ‘original’ the *Making of* documentary is not a passive progeny but a fully affective partner existing both in parallel and overlapping with the feature film’s narrative. The relationship between these diegetic and extradiegetic forms is central to the practice methods discussed below.

For the purposes of my research, practice has been limited to the making and remaking of 36 *breaking-machines* exhibited in three solo and six group exhibitions. A key element of the solo exhibitions has been the presence of the artist as repairman attending to the machines while they are on show. In each case, the *breaking-machines* combine simple mechanical devices made from reconfigured found materials, electric motors and sensors. These materials often highlight or encourage the processes of breakdown through their unsuitability. The incorporation of video cameras and audio recording devices into some of the machines involves them in the documentary process and serves to question the position of machine and human in the role of observed and observer. Discussed in [Chapter 1](#), these *breaking-machines* are further subdivided into the following overlapping typologies: the *approaching-breakdown-machine*, the *video-machine* and the *remade-breaking-machine*.

⁴ *The Making of Silent Running*, 1974 (discussed in [Chapter 3](#)) is the first of many feature length behind-the-scenes documentaries of Science Fiction films. While the shorts *2001: A Space Odyssey – A Look Behind the Future*, 1966 and *Bald: The Making of THX1138*, 1971 predate it, they did not delve as deeply into the material processes behind the production of illusion (IMDb, 2017).

- a. The *approaching-breakdown-machine* (see for example *Machine 16* in appendix 2) is a machine built to give the appearance of nearness to breakdown without truly breaking down. This is achieved by creating mechanisms with increased degrees of freedom introduced via loose joints, deformed or overly flexible parts and mechanical unbalance. In moving away from 'true' function the *approaching-breakdown-machine* will often exhibit an erratic range of irregular motions that appear unsustainable. However, in many cases these machines will continue to function for long periods of time while exhibiting seizes and play in their mechanisms. In the context of exhibition, the *approaching-breakdown-machine* is often supported by the ministrations of the artist who in the role of *Fiddler/Symphorophilic* (described below) is continually involved in a process of pulling the machine from the brink of breakdown. Through this process this type of *breaking-machine* allows a continued multisensory engagement between human and machine as it approached breakdown.
- b. The *video-machine* is typically a looped, single-channel video displayed on a monitor. This machine allows the continual rerunning of the process of breakdown of either a pre-existing mechanical device, such as an electric fan, or of an *approaching-breakdown-machine* that has achieved actual breakdown. The *video-machine* is a repeating machine that makes breakdown its product.
- c. The *remade-breaking-machine* is a product of the relationship of artist, machine and exhibition. Often this would involve the complete dismantling of broken machines and their reconfiguration into 'new' machines. Thus, the *remade-breaking-machine* becomes a physical marker of the processes of breakdown and repair, a marker that confirms the transience of machine and artist.

The *breaking-machine* belongs to the same phylum as Jean Tinguely's *Metamatics* machines that approach aspects of humanity as they approach breakdown (Kricke et al., 1960: 97). However, film of the artist and public interacting with the *Metamatics* reveals a clear delineation between human and machine (Pathé, 1959). The

machines of *Breakdown* play with a far gentler machine-human relationship in which the barriers are neither fixed nor clearly defined. Throughout their exhibition, I have spent significant time maintaining, repairing and, when necessary, remaking the machines. Though not explicitly presented as a performance much of this maintenance has taken place live and in public. The maintenance causes a confusion, both in relation to my role and to a normative understanding of function and breakdown of the technical object. This confusion splits the reception of the *breaking-machine* in two.

- a. The machine has failed, creating a hiatus in the artwork. In this case, the machine, and its repairer are ignored until the repair is complete. Alternately the repairer and machine are understood as part of an extradiegetic activity, informing the artwork but not a part of it.
- b. The various enfoldings of human and machine brought about by the acts of maintenance are read as an awkward *ballet mécanique*; a spatial temporal recombination of mechanical and human bodies. Here the repair becomes a component of the artwork.

The fuzzy positioning of artist as creator/performer and gallery worker/technician is an approach that recognises the blurring of boundaries also encountered in the *Making of* documentary. Chapter 3 engages directly with the *making of* form using an artwork titled *AI*. *AI* took the form of the documentation of the construction and wearing of a robot costume that was neither completed nor worn. This unrealised artwork, a *Making of* documentary without a product, was then used as a tool for investigating the material/illusion and human/machine relationships at work in *Silent Running* (1972) and *The Making of Silent Running* (1974).

We did write a book in which you no longer know who is speaking: there is no basis for knowing whether it's a doctor, a patient, or some present, past or future madman speaking...

(Deleuze, 2004: 219)

In keeping with Deleuze's description of *Anti Oedipus*, 1972 I have divided the blurred personas I adopted during the machines' exhibition into four categories: The

Diagnostician, *The Symphorophilic*, *The Fiddler* and *The Executioner*. Ambiguous and intersecting, each of these personas sets up relationships with the technical object that produce differing results.

The role of the *Diagnostician* is used extensively in Chapter 2 in identifying the root causes and processes of forms of breakdown. It is an anthropomorphising role designating the machine as *patient*, suggesting close observation and care but also notions of success and the “scandal of failure” (Le Feuvre, 2010: 203-4). In *Western Attitudes Towards Death*, 1974 historian Philippe Ariés identifies a shift in the western understanding death between the 1930s and 1950s “One dies in the hospital because the doctor did not succeed in healing.” (Ariés, 1976: 88). Linking death and failure sets the role of the doctor as an agent of negentropy⁵ seeking to understand and counteract breakdown. There is also an element of detachment here, in the context of my research the *Diagnostician* is a truncated form of detective-doctor less concerned with the repair of the machine than with an understanding of the processes of its undoing.

This element of morbid fascination blurs into my second role, the *Symphorophilic*. This form of paraphilia first coined by John Money in his 1984 paper *Paraphilias: Phenomenology and classification* is a sexual obsession with disaster. The protagonists of J.G. Ballard’s *Crash* (1973) who eventually move to the staging of car crashes for sexual pleasure are examples of the symphorophilic urge taken to extreme. In the case of my solo show *Love Machines* (2017) the pleasure of breakdown, the joy of the painful creak, the precarious quiver or the delicious smell of burning motors was an attractive force pulling the *Symphorophilic* in. This pleasure in mechanical suffering was also a driving motivation in keeping the machines running. In the role of the symphorophilic the *Love Machines* were MY machines: possessed, controlled and held in stasis in much the same way as Miranda Grey in John Fowles’, *The Collector* (1963) or Paul Sheldon in Stephen King’s *Misery* (1987). In both literary cases the captive is a creative, Sheldon a writer and Grey an artist and their captors attempt to access and control this creativity via acts of cruelty. Recontextualising Deleuze’s encounter with death in his discussion of

⁵ The origins of negentropy are discussed in the glossary.

Alain Resnais' *Van Gogh* (1948), to my encounters with MY machines suggests a way to understand this relationship between morbid fascination and creativity:

Between the two sides of the absolute, between the two deaths—death from the inside or past, death from the outside or future—the internal sheets of memory and the external layers of reality will be mixed up, extended, short-circuited and form a whole moving life, which is at once that of the cosmos and of the brain, which sends out ashes from one pole to the other. Hence zombies sing a song, but it is that of life.

(Deleuze, Tomlinson and Galeta, 2001: 209)

Here the morbid fascination of the symphorophilic can become a connective and creative force.



Fishbowl, 2017

Fishbowl (2017) is a documentary video of the function and repair of *Machine 27* (2017) while it was on exhibition as part of *Love Machines*. The repair sequence beginning at 1:00 shows a machine-eye view of fingers fiddling with its drive mechanism while it still runs. The actions recorded here are not exactly those of a technician or a mechanic but more of a *Fiddler*. The *Fiddler* has pejorative connotations; it was the name given by our father to my brother and I when we had broken a technical object through an excess of haptic investigation. As exhibited in *Fishbowl*, the approach of the fiddler involves a fingertip exploration and tweaking

of a mechanism. These actions often change the machine's functionality rather than restoring it to an original state. Significantly, *Machine 27* remained 'live' throughout the process creating another important shift. Here the machine is not a passive receiver of a fix but an active participant in a negotiation. This is also a role that emphasises the intimate connection and process of sensory feedback between human and machine. The *Fiddler* was the persona most encountered by the public during the exhibitions *Denis ex Machina* and *Love Machines*. As such it is also the role that questions most how the breakdown of technical art object is dealt with in the gallery situation. Rather than the more conventional methods of removing the artwork, or excusing its failure with a sign, the *Fiddler* foregrounds breakdown as a performed act between human and machine.

During *Love Machines*, *Machine 33* after a long engagement with the *Fiddler*, tore its own wires out of the charger that powered it.



Machine 33, 2017

At this stage, the work was replaced by *Machine 32* and dismantled. Its parts were then dispersed and reused by the *Executioner*. Executioner is clearly a loaded word; however, it is used here as a term to describe a role which implements a plan. Although executioner implies a degree of finality and control it is also a reactive

role carrying out a basic process in response to breakdown. This removal, breaking up and reuse of the material that made up *Machine 33* considers the artwork as an assembly parts in transitory relation. Thus, the machine-artworks, the structure of the exhibition and the *diagnostician-symphorophilic-fiddler* become parts of a continually reorganising body. These parts emit forces which act on each other. The *Diagnostician* is drawn in by the symptoms of breakdown, the *Symphorophilic* and *Fiddler* are caught in feedback loops of fascination and adjustment and the *Executioner* is called by breakdown to function as an alternating entropic and negentropic force.

ii. *The Speculative Machine*

In the corner of a gallery, on the floor, sits a television, a wooden box with a hinged lid and a man. Every thirty seconds or so, the hinged lid lifts, the television screen lightens and a squeal of feedback hurts the man's ears. He adjusts the volume on the TV and waits for the lid to lift again. This time it judders and creaks but the television emits no sound. The man adjusts the volume again until a low moan fills the room. The lid drops suddenly and this time, when it raises, the painful feedback returns. The man adjusts the volume.

(Pearl, Description of *Machine 20* at *Love Machines*,
Colchester, 2017)

My practice-led research utilises the machine-in-breakdown as both a subject of enquiry and a producer of research methods, *A Speculative Machine*. This approach was generated by the frequent interactions required in the repair and maintenance of machines whose predisposition is breakdown. As the passage above reveals, the exhibition of the machines of *Breakdown* created a fluctuating relationship between artist and artwork. The role of the artist flickered between creator, and DIY repair man, reflective observer and entangled participant, working with, rather than at the centre of, technology. This approach considers the posthuman decentring of the Vitruvian man in the writing of Rosi Braidotti (2013: 2) and Karen Barad's

“performative account of material bodies” (2007: 139) both of which insist that the human, rather than bounded and individual, be considered as part of a dispersed network of interacting parts.

Drawing on Deleuze and Guattari’s notion of the desiring machine as both connecting and interrupting flows (1983: 31) the idea of the speculative machine as a methodological model has been employed by researchers across the social sciences and arts. In their *Manifesto On Art, Design and Social Science—Method as Speculative Event*, 2015 Australian academics from schools of Ethics and Law in Medicine, Sociology, Arts and Media proposed that a playful use of cross disciplinary techniques could be employed as part of a speculative methodology (Michael, M et al., 2015: 190). Their manifesto refers to these techniques as “‘propositional machines’ enabling the potential emergence of odd and unexpected relationalities.” (Michael, M et al., 2015: 191). Jamie Brassett continues this theme. Introducing the idea of *Speculative Machines* in the context of digital technology and design he states:

A Speculative Machine, then, is such a Spinozistic body: in motion, impacting, colliding and repelling. A singularisation of a multiplicity of parts that themselves smear through other bodies.

(Brassett, 2016: 166)

The machine described by Brassett is both connective and a dynamic producer. It is not the machine of efficient and repetitious function but instead it is a *breaking-machine*; affective and productive of unexpected gestures. Brassett’s machine is, however, an intellectual construction. In contrast, my work *Breakdown* (2015-18) sets up situations in which the researcher is embedded in, and led by, material and kinetic mechanisms. My machines’ creaking gestures of repetition and interruption are then used to unlock the language of mechanical breakdown. This language is in turn used as a speculative toolkit for examining the anthropomorphic relationship between humans and machines.

iii. Whitehead's Speculative Methodology

The *Speculative Machine* is a product of speculative methodologies developed from recent revisitings to the work of Alfred North Whitehead in Isabelle Stengers', *Thinking with Whitehead* (2011) and Steven Shaviro's, *The Universe of Things*, 2014. The idea of the *Speculative Machine* is also supported by the emphasis given to the creative methodologies applied by art practitioners in what Jussi Parikka calls "Remediation"⁶ (Parikka, 2012: 136-158)⁷.

In *Process and Reality: An Essay in Cosmology* (1929), Whitehead sets out the process of Speculative Philosophy stating:

The true method of discovery is like the flight of an aeroplane. It starts from the ground of particular observation; it makes a flight in the thin air of imaginative generalisation; and it lands again for renewed observation rendered acute by rational interpretation.

(Whitehead, 1978: 5)

Bogdan Rusu's *Whitehead's Concept of Speculative Philosophy- A Metatheoretical Perspective* (2010: 92-93) breaks Whitehead's methodological simile into three phases. Firstly, he states that the phrase "particular observation" pertains to the observation of domains of knowledge identifying that speculative methodology is multidisciplinary taking as its starting point a broad field of observation (Rusu, 2010: 92). For this research, the "particular observation" was my observation of the emotional response evoked by the breakdown of machines made for a series of *Automatic Films* completed between 2006 and 2014. In his review of *Trying to Cope with Things That Aren't Human*, 2009, Martin Herbert noted the anthropomorphic

⁶ Parikka defines remediation as a way to understand the continual "resurfacing" of old media (Parikka 2012: 3)

⁷ Parikka characterises the machine as an assistant to thought as typified by Erkki Huhtamo's concept of *Thinkering* (Parikka, 2012:141) and the *Critical Making* methodologies developed by Garnet Hertz and Matt Ratto (2012:147) or, as forging connections beyond the mechanical. Indeed, Matthew Bowman suggests that the breakdowns exhibited in my solo show *Love Machines* move our attention beyond the mechanical and "provoke reflection on our own fragility" (Bowman, 2017:34).

qualities of the *Automatic Films* describing them as: “instinctively humanised, expressive and liquefied, dodging around the medium’s potential coldness” (Herbert, 2009: 27). I found that this was a response echoed in television comedy, science fiction writing and film making. The second phase of “imaginative generalisation” Rusu connects with Whitehead’s “play of the free imagination” and “play with inconsistency” (Whitehead, 1978: 5). Again, in terms of my research this phase is related to the construction and playful involvement with machines to imaginatively explore processes of breakdown in the search for, and creation of, connections between mechanics, medicine, philosophy and science fiction. The third phase of the method is the “pragmatic test” of the generalisation. Where the observations of the imaginative flight are applied to another field and should lead to new understanding (Rusu, 2010: 92). Here the re-examination of anthropomorphism in machines will form my pragmatic test.

Whitehead defines Speculative philosophy as successful if it fulfils four main criteria. These are that it be *coherent*, *logical*, *applicable* and *adequate* (Whitehead, 1978: 4). Coherency for Whitehead refers to the idea that nothing stands in isolation from the rest of the universe, that all things are connected and must therefore obey the same rules (Whitehead, 1978: 7). His main argument is that theory should be internally consistent. In pairing coherence and logic, he is describing a model whose internal and external connections are seamless much like the patterns suggested in fractal theory or by the perfectly connected crystalline world evoked by Italo Calvino in *T-Zero* (1976: 28-38). This process of apprehending the micro and macrocosm simultaneously has again been picked up by Bruno Latour’s Actor-Network-Theory (Latour, 2007: 90) and Karen Barad in her discussion of the universal application of quantum theory (Barad, 2007: 350). In describing his second and third criteria Whitehead states that the “texture of ideas must match the “texture” of experience (1978: 3-4). Isabelle Stengers explains these two criteria in terms of how well the theory “communicates” with experience (Stengers, 2011: 247).

The themes of causal linearity and coherent logic in Whitehead's process can be compared to the transfer of forces across a smooth functioning mechanism.



Machine 23, 2017

However, *Machine 23* (2017), for example, is typical in its interruption of these notions. *Machine 23*'s mechanism is fraught with seizes and slippage. The forces it generates deform and pierce its cardboard casing. Over time, parts have shifted, weakened or fallen off, generating new directions and unexpected mechanical gestures. These directional changes are central to my methodology. In their co-formation of failure and connectedness they impel logical and disciplinary shifts.

a. Failure

Mechanical breakdown is usually described as a form of failure and although my research will argue that this is not necessarily the case, the practice of *Breakdown* engages with artistic methods of failure. Hans Joachim Müller in his essay *Failure as a Form of Art* (2009) reprinted in *Failure*, 2010 (Le Feuvre, 2010: 200-204) introduces the connection between failure, breakdown and repair in early Christian mythology when he suggests that the creation of eve was a patch or "correction" for an already faulty Adam (Le Feuvre, 2010: 200). Using the classical myth of Daedalus and Icarus, Müller goes on to divide failure into: the "scandal of failure" and the "event of failure" (Le Feuvre, 2010:203-4). The event of failure for Müller is an opportunity to revel in the process, to engage with it without reason. Le Feuvre

picks this up in her introduction stating:

Failure, by definition, takes us beyond assumptions and what we think we know and can be represented.

(Le Feuvre, 2010: 18)

Failure as a speculative methodology is adopted by contemporary artists such as Francis Alys, Allan Currall and Karl Heinz Jeron whose robot performer *Sim Gishel* (2012) displays various aspects of failure in its career as a singer. The challenge for, and new area explored by, the works of *Breakdown* is to keep failure going, to make machines that continue to break down for as long as possible. Rather than present breakdown as an event only repeated through retelling, *Breakdown* aims to treat it as a metamorphic and connective process.

Whitehead's central image in describing the speculative method involves the interaction of human and machine. As noted above the imagery of the "true method of discovery" (1978: 5) is the flight of an aeroplane-human assemblage and is more closely linked with the idea of failure than one might at first realise. The use of the aeroplane as a metaphor for philosophical enquiry in 1929 implies more of a sense of risk and adventure than it does today. In *Wind, Sand and Stars* (1939) Antoine de Saint-Exupéry details the experience of mechanical flight in the 20s and 30s. It is a memoir filled with mechanical failure and mortal danger. The flights Saint-Exupéry describes are balanced on the edge of disaster; at the mercy of unpredictable winds, flying blind below the clouds and avoiding the dangers of the sea where forced landing would mean certain death (2000: 12-14). For Saint-Exupéry the aeroplane is a machine that creates encounters with nature and reconfigures human relationships with the world (2000: 33). What *Wind, Sand and Stars* adds to Whitehead's aeroplane image is the fragility of a machine. The aeroplane's predisposition towards breakdown adds to its effectiveness (and affectiveness) as a speculative tool. As suggested above, this breaking-machine "smears" (Brassett, 2016) itself through the organic and inorganic, across disciplines and binaries. It also defines the artist's complete involvement in the apparatus of research. Here the artist acts not as a detached external observer nor even as an observer connected to the apparatus of observation but as an integrated (and imperilled) element diffracted through the

speculative machine; acting in collaboration with and against elements of a continually adjusting and productive mechanism, a *breaking-machine*.

b. Connectedness

In *The Universe of Things* (2014) Steven Shaviro explains the range of interesting connections between Whitehead's Speculative Philosophy and the work of writers associated with Speculative Realism and New Materialism. He notes that Whitehead states (like Barad) that things in themselves do not exist, asserting that matter is formed from "drops of experience, complex and interdependent" (Whitehead, 1978: 4). This emphasis on relation insists that rather than examining the objects of *Breakdown* it is necessary to examine the connections they form. In terms of the machines and videos produced for *Breakdown* this involves a close inspection not only of the mechanical linkages in each machine but also of the linkages between: digital and analogue video, between pin joint and cochlear. Machines constructed for my research have revealed that in many cases breakdown occurs at these interfaces; that connection is also productive of failure. In *The Universe of Things*, Shaviro develops his own understanding of a non-cognitive connectedness, a "sensibility or sensitivity without knowledge", (Shaviro, 2014: 147) through the concept of *contact-at-a-distance* (2014: 61, 118, 147-148) and invites us to:

Consider perception as a nonrepresentational process of continual feedback, response, and adjustment.

(2014: 118)

These ideas of connectedness are consistent not only with the methodology for understanding the processes at work in *Breakdown* but also in the making of the work itself. Here the Artist (and viewer) are decentred and drawn into a feedback loop with machines as they break down.

iv. The Decentred Researcher

In writing this thesis the interpretative methods employed were also derived from the machines and their breakdowns. This is a process that gives voice to the technical object, that acknowledges its position as Latour's *actant* (Bennett, 2010: 9) but also as what Graham Harman calls an *ally*; something that we work with and that works with us (Harman, 2009: 19). This process also serves to knock the researcher off centre, an idea picked up by the artistic methodologies *Thinkering* and *Critical Making* both of which seek to elide making and thinking (Ree and Ratto, 2012) and to unpack technology that has remained blackboxed (Garnet, 2012). *Critical Making* as a methodology places emphasis on the ongoing process of making over that of the finished product and an unsettling emotional engagement between object and maker.

The process of being humiliated by things that you think
are easy or mindless is a valuable experience
(Garnet, 2012)

This act of decentring by the *breaking-machine* runs through each of the chapters.

An observation that the machines of *Breakdown* repeat with variation led to Chapter 1 being structured using the idea of mechanical retelling, a repetition with difference brought about by play in the mechanism. This method is used to construct an idea of the machine that overlays itself in its replication. In keeping with Whitehead's speculative methodology this is a replication that moves through the realms of fact and fiction combining the time-blurred alien vision of Kurt Vonnegut's Tralfamadorians (200: 71) with the most mundane of digital machines the Gif.

Chapter 2 employs a symptomatic approach to the understanding of the different forms of breakdown and their effects on the mechanism. Symptomatic diagnosis is used both in medicine and mechanics and involves a process of tracing back to cause. In this it is recognised that symptomatic diagnosis is a causal, normative process and seeks to break it down by studying the effects of breakdown from the point of view of the machine. This allows breakdown to be understood as a *junction*,

a moment of spatio-temporal change. By repositioning breakdown beyond the causal and the normative I identify four types of breakdown each with their own set of action and gestures.

Chapter 3 takes the mechanism of an illusion-producing-machine the Thaumatrope and the *Making of* documentary to investigate the anthropomorphic relationship between humans and machines. The Thaumatrope, literally *wonder turner*, is a 19th Century optical toy. It consists of a card disc with different images on each side. When the disc is spun on its axis the images are combined to form one, a reminder of the material nature of vision. The most common thaumatropic iteration is a bird and a cage, a play on the binaries of nature and culture. This thaumatropic production of illusion via the superimposition of two opposed images; its flickering gestures, allow the pulling together of binaries of human/machine, fact/fiction and function/breakdown.

LITERATURE REVIEW

- i. Introduction
- ii. The Machine and the Artist
- iii. The Machine in Theory
- iv. Dispersed Bodies
- v. Dividing Accident and Breakdown
- vi. The blackboxing of Breakdown
- vii. Auto-Destruction and Breakdown
- viii. Avoiding 'Good' and 'Bad' Anthropomorphism

i. Introduction

This literature review seeks to position the machines and videos that constitute *Breakdown* within an artistic phylum stemming from the 1950s *Méta-matic* works of Jean Tinguely and Gustave Metzger's *Auto Destructive Art* manifestos of 1959-1964. It does this to look specifically at the human-machine relationships developed by these works in relation to modes of breakdown. The scattering and recombination of bodies (human and machine) has become a central to my understanding of the processes at work in *Breakdown* and takes its lead from Karen Barad's *Meeting the Universe Halfway* (2007). Thus, praxis and Barad's work on Agential Realism allows for a re-examination of Deleuze and Guattari's anthropocentric theories of the machinic. In her recent book *The Posthuman* (2013) Rosi Braidotti examines what she calls the continual "recapitulation" (Braidotti, 2013: 29) of da Vinci's image of Vitruvian man in the humanist tradition. Noting the prevailing idea that "difference spells inferiority" (Braidotti, 2013: 15) she searches for a *posthuman* decentring of this model (2013: 77). In examining the practice of theorists, contemporary artists and writers the literature review also finds a *postvitruvian* position for my work that builds on past practice and develops a new understanding of breakdown and the anthropomorphic relationship between humans and machines.

ii. The Machine and the Artist

The artist-machine relationship is central to the methodology of *Breakdown*. The personas I adopt in the repair and maintenance of my machines during their exhibition engages with the practice of artists such as: Jean Tinguely, Rebecca Horn, Pierre Bastien and Karl Heinz Jeron. It is also important to consider the adoption of mechanomorphism by Andy Warhol whose practice and persona repeatedly engaged with mechanical appearance and process. Each of the artists discussed in this section develop particular relationships with their machines (and themselves), relationships that imply degrees of control and release. In a 1959 *Pathé newsreel* Tinguely is shown demonstrating a *Méta-matic* and watching with an expression of critical

attentiveness as it produces a tachist drawing⁸. The attention the artist gives the erratic movements of the machine serves to set up a performative relationship. Indeed, Tinguely's events such as his parade of machines through the streets of Paris, *La Transport* (1960) or the 1959 *Cyclo-matic* event at the ICA London (Satz and Wood, 2009: 154) revealed a propensity for showmanship (Wilson, 2008: 184). Each event presented Tinguely as a circus barker or sideshow host and employed deliberate media engagement as a part of the production (Schavemaker et al., 2016:60). Indeed, the artist's Vitruvian relationship with his machines typified in the many press photographs that assert the centrality of the artist. In his statements and interviews Tinguely, reinforces this relationship of control and display, portraying



Tinguely with the remains of *Study for the End of the World*, 1961 (Schavemaker et al., 2016)

⁸ In July 1959 Tinguely exhibited the *Méta-matics* at the Iris Clert Gallery (Satz and Wood, 2009:148). Essentially drawing machines they could be operated by members of the public by placing a token in a slot.

the technical art-object as a performing animal to be tamed and deployed as a creative tool (Museum Jean Tinguely, 1996: 45). There is also a sense most strongly expressed in the work of Tinguely but also of those artists that follow of ‘taking sides’ in their relationships with machines. In defining their roles as showman, parent or educator these artists are setting themselves apart from the machines. This notion of separateness is something that I dismantle in my own exhibitions. My solo exhibition *Love Machines* (2017), although containing many similar components to Tinguely is more understated, and multivalent. In refusing the role of showman, indeed in refusing to stick to any single role, I introduce an inherent uncertainty into the relationship between artist, machine and audience. In moving between the roles of the *Diagnostician*, the *Symphorophilic*, the *Fiddler* and the *Executioner* as described in my methodology any notion of Vitruvian stability or hierarchy is replaced with a model of shifting temporal relationships.

In contrast to Tinguely, Andy Warhol continually sought to connect both his artistic persona and practice with the machine. In a 1963 interview with Gene Swenson Andy Warhol made three revealing statements about this act of mechanical (Gene Swenson’s question in italics):

I think everybody should be a machine.
I think everybody should like everybody...

And liking things is like being a machine?
Yes, because you do the same thing every time. You do it over, and over again...

I want to be a machine, and I feel that whatever I do and do machine-like is what I want to do.

(Russell and Gablik, 1969: 116-19)

Here Warhol is introducing an aspect of mechanomorphism whereby he essentially costumes himself as a machine, sheltering in its toughened carapace and mechanistic actions. Paul Bergin in his 1967 article “Andy Warhol: the Artist as Machine” recognised the significance of mechanical action both in the production of Warhol’s work and his public persona. He notes that, like his screen prints, Warhol is presented as surface, a mask (leather, dark glasses, artificial hair) stating he is “not

to be thought of as a man with a past” (Bergin, 1967: 359). In his article “Death in America” Hal Foster develops this idea. Here Foster describes Warhol as a “shocked subject” (Foster, 1996: 39) suggesting that his mechanomorphism is an attempt to protect himself from trauma. Foster’s thesis is that Warhol is escaping his subject matter by withdrawing into machine-like repetition (1996: 42). Indeed, in the Swenson interview quoted above, Warhol evokes a machinic repeat common in our twenty-first century online lives, suggesting that everyone *like* everything over and over again. For Warhol, the suggestion is that being a machine is *nice* but it also creates a protection; it invites *niceness* from others.

While, as Bergin and Foster suggest, Warhol employ’s the machine as a protective mask, this imagery also conjures up the inversely parallel science fiction trope of the machine masked as human. It predicts both the emotionally stunted androids (*Andys*) of Phillip K Dick’s *Do Androids Dream of Electric Sheep*, 1968 (short lived machines without pasts) and the endlessly repeating robots of science fiction horror films *Westworld*, 1973 and *The Terminator*, 1984 in which the machine’s lack of humanity is revealed by the removal of its mask. In all cases these *Andys*, human

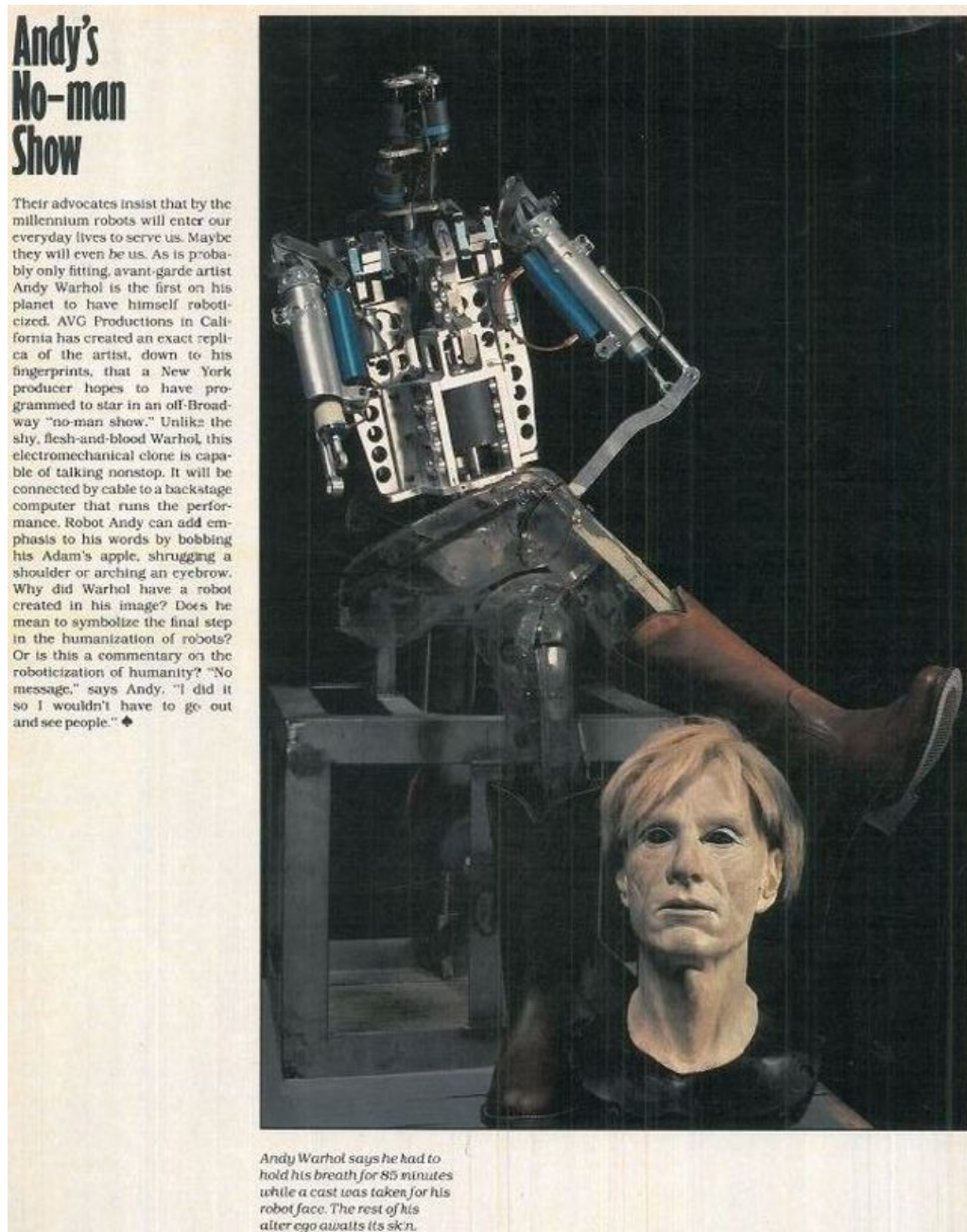


Westworld, 1973

and machine, are involved in a process of separation from emotion via an engagement in a continually ‘present’ repetition. *Westworld*’s cowboy repeatedly starts and loses gunfights only to be reset for the next day’s entertainment. The Terminator is sent from the future to change the past, to erase memory, its

inhumanity is embodied in his relentless obsession with the present via its programmed instruction to kill Sarah Connor.

In 1983 Warhol entered into a project with producer Lewis Allen and director Peter Sellars to create a Broadway “No-man Show” in which Warhol’s presence would be replaced by a robot. Though never brought to completion, the process of the project



Wexler, *Life*, 1984

is recorded in a video *making of* documentary by John Sorensen *The Andy Warhol Robot a “No Man” Show*, 1992. This details the exhaustive process of filming, photographing and measuring the artist so that he could be replicated mechanically

and is narrated with excerpts from Warhol's diaries. In these diary entries Warhol focusses on descriptions of the phlegm he couldn't cough up during the casting of his face and the number of motors required for a single facial twitch (Sorensen, 1992) revealing Warhol's interest in mechanical and bodily processes. The publicity photograph (above) used in *Life* magazine's 1984 article "Andy's No-man Show" again mimics the unmasking of the machine in science fiction cinema. The decapitated, hollow-eyed head of Warhol forms a striking contrast at the feet of the jauntily camp robot body. There is a sense in Warhol's *No-man Show* of an endless Russian doll of human and machine; a human mask is removed to uncover a machine, a machine mask removed to uncover a human and so on.

repetition is truly that which disguises itself in constituting itself, that which constitutes itself only by disguising itself. It is not underneath the masks, but is formed from one mask to another... the masks do not hide anything but other masks.

(Deleuze and Patton, 1994: 20)

Here in *Difference and Repetition* (1968) Gilles Deleuze describes a similar process and crucially states that repetition essentially reveals nothing except another repeat. For Warhol, the comfort of machine-like repetition is founded upon the same idea that that nothing is ever revealed. This is echoed in Warhol's comment at the end of the *Life* article, when asked what his message is, he replies: "No message...I did it so I wouldn't have to go out and see people." (Wexler 1984).

Warhol's cyborg processes of art production are, like *Breakdown*, almost performance and certainly performative. His play of attachment and detachment and focus on material process is also a clear progenitor for the work *AI* discussed in Chapter 3. However central to Warhol's desire to be machine-like is founded on the idea of the machine's difference from the human, a difference that shields. Like Tinguely there is again a sense of the artist 'taking sides' in the relationship between the human body and the machine.

Rebecca Horn foregrounds her personal bodily experience as being essential to an understanding of the machines that have formed a central part of her practice since the 1970s. As Germano Celant notes in the first of two Bastille Interviews:

In the early work, you were the human body
becoming the machine and then, slowly, this body
disappears and a machine comes in, replacing it.
(Horn, 1993:17)

There is the feeling in her delicate machines that the body has been pared away leaving just the essential mechanism behind. Horn's machines are tactile but not touchable, a quality embedded in their delicacy and in the knives and other sharp objects often included in their mechanisms. Horn also reveals an anthropomorphic relationship with her machines.

Have you ever seen a car run forever? Like us they
have a lifespan. They are human when they faint
and then die... for me, all of these machines have a
soul because they act, shake, tremble, faint, almost
fall apart, and then come back to life again. They
are not perfect machines.
(Horn, 1993:17-18)

Here she separates her *art-machines* from the quotidian technical object; characterising them with specific human traits. For Horn, the anthropomorphism of her machines is evoked through their difficulty with repetition, or rather their engagement with an irregular repetition. This important notion is explored further in relation to Guattari's concept of the *ritornello* in Chapter 1. Paradoxically, Horn applies a persona of detachment or even abandonment to her human-machine relationship. Leaving her machines to their fate, she describes them as "melancholic actors performing in solitude" (Horn, 1993: 27). Indeed, in encountering Horn's work in a museum it is not uncommon to find it stilled by some form of breakdown; awaiting repair. This space between function and breakdown is key to my exploration of mechanical breakdown. In my exhibitions *Love Machines*, and *Denis ex Machina* I enter this space, repairing and working with my machines in public. This approach allows a live exploration of the machine-human relationship in the moments of breakdown. Although my role as repairman in these exhibitions is not foregrounded as a performance it has aspects of performance that place it in relation to performance artists such as Pierre Bastien, and Stelarc. The latter's initial "obsolete body" event was held in 1980 (Smith, 2005: 8) when he presented *Third*

Hand, a cybernetic extension of his own body. His professed aim in these demonstrations was to break down the barriers between the body and technology (Atzori & Woolford, 2017) and in doing so, he cast himself as a demonstrator of a



Stelarc, *Involuntary Body/Third hand*, 1995

cybernetic future. Stelarc's technological didacticism is a mode adopted by many contemporary artists whose practice is engaged with the exposition of new technologies. This can be observed in the work of artists such as Anna Dimitriu⁹ and Julie Freeman whose recent *RAT.systems* (2017) has presented a data driven insight into the naked mole-rat to both scientific and artistic audiences. Ironically, as Amelia Jones suggests in her essay "Stelarc's Wet body" it is the fleshiness of the human body that is made central in Stelarc's demonstrations (Smith, 2005: 87-123). It is this Vitruvian centrality of the human, both physically and in the role of scientific demonstrator, that I seek to avoid in my machine-human relations. In the exhibitions, *Love Machines* and *Denis ex Machina* (2017) I avoid the didactic in neglecting to explain my role to the public. Thus, I become peripheral and fluctuating, an act that shifts attention to the interstitial.

⁹ Dimitriu works collaboratively with scientists and doctors exploring the fields of microbiology and machine intelligence. She presents herself using terms often reserved for scientific research such as "ground breaking" and is artist in residence on the Modernising Medical Microbiology Project at the University of Oxford (Dimitriu, 2017).

Musician and installation artist Pierre Bastien has a less structured relationship with machines than Stelarc. He has built a practice performing with a mechanical orchestra built from Meccano, found objects and musical instruments. Recent works such as *Paper Orchestra*, 2013 and *Mecanoid*, 2010 have been presented as installations and live performances during which Bastien improvises alongside his mechanical musicians. In a radio interview from the Museum of Art and Culture, Barcelona Bastien identifies the “surprises” that his automata introduce into a performance via “Hesitations in the mechanism” and the multiple overlapping of mechanical repetition (López, 2017). Live, these “surprises” create a dissonance that the human performer must adapt to. This relationship of adjustment to the rhythms of the machine is interesting in terms of my research because it suggests a bidirectional interaction initiated by mechanical stutter. Bastien is not seeking breakdown in his automatic accomplices but rather an aesthetic of discord. This observation also applies to Karl Heinz Jeron’s relationship with *Sim Gishel* (2014). *Sim Gishel* is a busking robot that performs in various venues and has entered talent competitions with some success. Its mechanically halting rendition of “Mad World” is again engaging because of its failure to emulate the skills of a professional musician. During its appearance at *RichMix* (2014) this was taken further when the machine began to sway so much that it fell to the ground and lay twitching on the floor. This moment of mechanical breakdown introduced uncertainty into the relationship between artist and art-machine as Jeron could be heard to ask what he should do? Jeron’s persona of nervous parent is a contemporary development of the more assured showmanship of Tinguely’s presentations and is an example of how the Vitruvian relationship to machines can be nudged aside by uncertainty and breakdown. However, both Bastien’s role of virtuoso-amongst-machines and Jeron’s persona serve to highlight difference between human and machine. My multiple and shifting relations with the machines of *Breakdown* lack definition and it is this continual lack of certainty that allows a more complex and *postvitruvian* understanding of machine-human relations to emerge.

iii. The Machine in Theory

My initial experience of working with the machines constructed for this research revealed two things. The first was an observation, concealed by many contemporary technical objects, that a machine is not an impermeable, inscrutable body but a temporary assembly of parts whose relationships are expressed by heat, light, sound, movement and smell. The second was that these ‘expressions’ were central to the creation of relationships with parts of my body: cochlear, optic nerve, fingertip. With these observations in mind my research into definitions of the machine was specifically aimed at looking at the ways in which these definitions constructed relationships between human and machine bodies. The work on early mechanology by Jacques Lafitte (1884-1966) and Gilbert Simondon (1924-1989) are central to this discussion in their attempts to describe distinct typologies of machines but also in Simondon’s influence on Gilles Deleuze which can be noted in his essay “On Gilbert Simondon” (Deleuze, 2004:86-89).

Lafitte’s *Réflexions sur la science des machines* (1932) assembles a typology of machines based on a wide-ranging resource. Andrew Iliadis provides a detailed list of this Mechanological bibliography in: *Mechanology: Machine Typologies and the Birth of Philosophy of Technology in France (1932-1958)* (Iliadis, 2015:134). Iliadis notes that the tenor of the *Réflexions* is hopeful in opposition to the more catastrophic human machine relationships outlined in Fritz Lang’s *Metropolis* (1927) and Karel Čapek’s *R.U.R.*, (1920) where the rise of machines is linked to the fall of humanity. In laying out his typology of machines Lafitte divides them into: passive, active and reflexive machines, describing a system of degrees of independence from their environment. In doing this Lafitte puts forward a model which presents the machine as both an extension of, integrated into and “identical” to the human (Lafitte, 1932/1972:101). This approach anticipates the understanding of machines and humans as entangled bodies later put forward by Donna Haraway in *Simians, cyborgs and women* (1991) and Rosi Braidotti in *Metamorphoses* (2002).

As discussed in [Chapter 1](#), Gilbert Simondon's 1958 text, *On the Mode of Existence of Technical Objects*, defines a typology of machines that shifts from what Iliadis calls Lafittes's "levels of function" to "levels of organization" (Iliadis, 2015: 143). This, like *Réflexions*, can be read as a utopian project leading towards the harmonisation and integration of human and machine. Simondon characterises machines as negentropic forces in parallel with life; forces of organisation and information in opposition to the degradation of energy and dissolution of the universe (1958: 9). This flux between order and dissolution is central to my discussion of the types of breakdown in [Chapter 2](#): play, the seize, burnout and cutting loose. It also a key theme in science fiction writing in the second-half of the twentieth century. Brian Aldiss' *Greybeard* (1964), Isaac Asimov's *I Robot* (1950) and J.G. Ballard's *The Drowned World* (1962), for example, assign machines the role of battling against entropic forces¹⁰ with varying degrees of success. The development of machines from individual negentropic actants to a dispersed collective in *I Robot* is a useful tool to think through the human machine relationship. Also of interest here are the implications of Simondon's move from function to organisation.

An individual technical object is not such and such a thing, something given *hic et nunc*, but something that has genesis. The unity, individuality, and specificity of a technical object are those of its characteristics which are consistent and convergent with its genesis. The genesis of the technical object is part of its being. The technical object as such is not anterior to its own becoming but it is present at every stage of its becoming.

(Simondon, 1958: 12)

In freeing the machine from function, Simondon redefines the body of the machine as a continually reforming temporal process and one that enacts itself. Deleuze later stated that: "individuation appears as the advent of a new moment of Being"

¹⁰ Specifically, in *The Drowned World* the protagonists struggle with the entropic call of the heating planet is held in abeyance by his ramshackle air conditioning unit. (Ballard, 1968: 10) In Aldiss' *Greybeard*, the protagonists are tasked with recording an increasingly entropic world using a technology packed truck (Aldiss 2011: 60). Aldiss and Ballard's entropic fascination is discussed in detail in Colin Greenland's *The Entropy Exhibition* (2013) which examines the rise of New Wave science fiction in 1960s Britain.

(Deleuze, 2004: 88) using Simondon's theory to assert that this "moment of Being" is both multiphasic and changing (2004: 89). These ideas of transformation and connection are central to Gilles Deleuze and Félix Guattari's theories of the machinic.

Everything is a machine. Celestial Machines, the stars or rainbows in the sky, alpine machines - all of them connected to those of his body.

(Deleuze & Guattari, 1983: 9)

Quoting Georg Buchner's 1936 novella, Deleuze and Guattari continue to use their formulation of schizoanalysis, a psychoanalytical approach based upon the structures of mental breakdown. Both *The Machinic Unconscious* (1979) and later *Anti-Oedipus* (1983) set out a new understanding of the unconscious as a productive machine connecting to other machines: physical and social (Guattari, 2011: 9-11). Key to this machinic understanding is that it is a model of connections between nonhuman and human, between physical objects and ideology. However, it is still a model that emphasises the centrality of the human. In "Machinic Heterogenesis" (Conley ed, 1993: 13-27) Guattari takes this further by describing the mechanical diagram as a sort of "soul supplement" (1993: 18). He uses this anthropomorphic image to place the human at the centre of the machine.

iv. Dispersed Bodies

Guattari's anthropocentric structure has been addressed in recent writing by theorists such as Donna Haraway, Karen Barad and Bruno Latour who in *Reassembling the social: an introduction to actor-network-theory* (2005) asserts the importance of objects as actants in a network (Latour, 2007: 131). Particle physicist and feminist theorist, Barad takes this further. Her recent work *Meeting the Universe Halfway: Quantum Physics and the Entanglement of Matter and Meaning* (2007) investigates the onto-epistemological implications of Niels Bohr's writing on quantum physics and introduces her concepts of Agential Realism and *intra-action*. Barad develops Agential Realism as an ontoepistemological (Barad, 2007:44) framework in which she holds that phenomena and not objects are the primary epistemological unit. She asserts that things do not exist in themselves as discrete bodies but are constantly

made and remade through *intra-action* (Barad, 2003: 817), a connective process that insists on the “inseparability of “objects” and “agencies of observation” (Barad, 1998: 96). Crucially for this research, Barad posits that bodies do not have fixed boundaries.

This is true not only of the surface or contours of the body but also of the body in the fullness of its physicality, including the very “atoms” of its being. Bodies are not objects with inherent boundaries and properties; they are material-discursive phenomena.

(Barad, 2007: 823-4)

This suggests that with any machine-human encounter the experience is more than just intimate, it involves the remaking of a new machine-human body moment to moment. However, while Barad’s notion of phenomena is central here, she does not attend to the specifics of how these bodies might be formed. In response, this research brings together Barad’s Agential Realist approach with a detailed examination of and haptic engagement with the symptoms and signals of breakdown in my machines. From this I show how bodies form around the mechanical gestures of function breakdown by recycling Deleuze’s little examined concept of love and Guattari’s *ritornello*¹¹. To do this, I deploy the mechanical term *Linkage*.

Donna Haraway has background combining: biology, zoology, literature and philosophy. She considers the metaphors used in science and feminist narratives to present a dispersive approach to bodies. Key works include: “Cyborg Manifesto” in *Simians, Cyborgs, and Women: The Reinvention of Nature* (1991) and “A Game of Cat's Cradle: Science Studies, Feminist Theory”, *Cultural Studies* (1994). Haraway's metaphorical approach parallels many aspect of Barad’s Agential Realism and her understanding of the game of Cat's cradle heralds Barad’s notion of *intra-action* in what she terms “the semiosis of embodiment” (Haraway, D. 1994: 71). No doubt stemming from Haraway’s notion of the tangle being “necessary to effective critical practice” (Haraway 1994: 69), Barad regularly employs the idea of “entanglement”

¹¹ This musical repetition is explored by Deleuze and Guattari in their discussion of the *ritornello*, or little return, in *A Thousand Plateaus*, 1980. Translated as “refrain” by Massumi the *ritornello* is described by Guattari as a reassuring territorialising repetition observed in birdsong or the comforting tra la la of a child singing in the dark (Deleuze and Guattari, 1987: 299).

in her writing (Barad, 2007:35). In terms of the examination of machines and machine-human interaction this is an imprecise term that covers up the details of force and trajectory at work in the dispersed body. Instead I describe the relations between part in terms of *linkages* a term derived from works on Kinematics (see glossary) such as Thomas Wallace Wright's, *Elements of Mechanics including kinematics, kinetics and statics* and Franz Reuleaux's *The Kinematics of Machinery: Outlines of a Theory of Machines* (1896). Reuleaux describes the linkage as a series of links joined together and transmitting forces along a kinematic chain:

The whole now forms a linkage returning upon itself, like an endless chain, consisting simply of single links connected together. A combination of pairs of elements in this way we shall call a chain, or more fully a kinematic chain. The body which is formed by the junction of the elements of two different pairs is then a link of the kinematic chain.

(Reuleaux, 1896: 46)

It is clear from Reuleaux's descriptions that: not only are bodies constructed of linkages and that linkages run through and beyond bodies but that also that new bodies are formed at junctions within a linkage. Deleuze and Guattari also use the term *linkage* extensively in *A Thousand Plateaus: Capitalism and Schizophrenia*, 1980 as the cumulative word for the fluctuating nexus of connections between bodies (Deleuze & Guattari, 2002: 493). The workings and gestures of the machines of *Breakdown* are central to my understanding of the word linkage. Observation has revealed that in function and in breakdown the linkage will respond differently in respect to the direction, location and degree of force applied and that changes in any linkage will have a corresponding effect on the transmission of force through its connections human and machine alike.

v. Dividing Accident and Breakdown

Before investigating breakdown in detail, it was necessary to divide it from the accident. Paul Virilio's writing on the accident is key in western theory in raising its

importance from the incidental to the central (Virilio, 2008: 46)¹². Key works include: *Unknown Quantity* (2002) or its French title *Ce qui arrive*, an exhibition and extended catalogue, *The Accident of Art* (2005) and *Pure War* (2007) where Virilio introduces and develops the idea that accidents are revelatory potentialities (Virilio, 2005: 63) embodied within an object or invention. A passage from *Pure War* (2007) is key in understanding the roots of Virilio's ideas on the accident. Recounting a wartime experience, Virilio describes the moment he witnessed when a little girl steps out onto her balcony after curfew and is shot through the eye by a patrolling sailor.

I was born there and I will die there.

(Virilio, 2008: 220)

This 'accident' holds many of Virilio's recurring themes in a single event: architecture's relationship to danger, safety and control; speed, the effect of distance; and technology and its integral accident. (Virilio & Lotringer, 2007: 220). Indeed, in Virilio's writing there is a continual anxiety about the cost of technology and its impact on the body. His writing on the accident is also influenced by his Catholicism. This is evident in his definition of the integral accident as both "profane miracle" (Virilio, 2005: 63) and original sin (Virilio, 2008: 202). In doing so he introduces the idea of the accident as a kernel of knowledge that is revelatory and embedded in the technical object. However, Virilio's tendency to include under the accident: natural disaster, deliberate human acts and breakdown have been criticised (Nechvatal, 2002). There is room to look at mechanical breakdown as a separate phenomenon. It is useful to consider mechanical breakdown as being closer to Aristotle's *automaton*. *Automaton* – or spontaneity was a term used by Aristotle to explain natural phenomena that appear accidental but in fact are caused by the material qualities of an object (Aristotle, 350BC: Bk2 pt4). Applying this notion to this research, allows us to understand mechanical breakdown not as revelation but as a moment of change expressed by the materials and components of the machine's manufacture.

¹² Ross Hamilton, *Accident, A Philosophical and Literary History* presents a historical survey of the rise of the importance of the accident in western literature. He charts the change from Aristotle's incidental *accidens* to Virilio's notion of the accident as central and concludes that the accident has become intrinsically linked to concepts of modernity and identity (Hamilton, 2007: 299-304)

vi. The Blackboxing of Breakdown

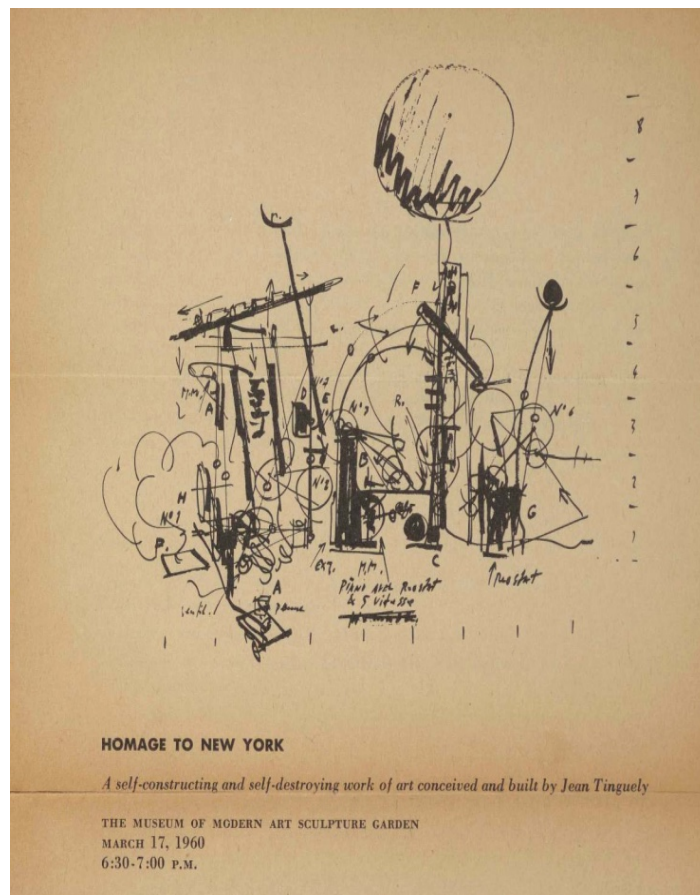
The idea of the breakdown is identified by Stephen Crocker in *Bergson and the Metaphysics of Media* as being a prevalent theme in western philosophy (Crocker, 2013: 13). In discussing Bergson's notion of truth in breakdown he also invokes the Kantian sublime; Deleuze and Guattari's desiring machines; and Benjamin's writing on epic theatre. Crocker notes "failure... is often the necessary precondition for epiphany and insight" (Crocker, 2013: 131). Other examples of this observation can be found in Badiou's concept of "the event", a rupture that reveals the truth (Badiou, 2007: xii) and in Jean Baudrillard, who in *Fragments* describes technological breakdown as "a sort of breach opened up by objects." (Baudrillard, 2004: 62). These theoretical accounts, treat breakdown as a stereotyped event. In *Meeting the Universe Halfway* (2007) Barad asks: "What happens when machines stop working? Could this form of work stoppage be considered a form of machinic agency?" (Barad, 2007: 231) Although Barad's agential realist approach repositions mechanical breakdown as machine agency, part of a web of communication that brings bodies, human and non-human, into being there is no attempt to delve into the subtleties to this agency. Frank Trentmann in *Materiality in the future of history: things, practices, and politics* (2009) makes a similar argument suggesting ways in which breakdown or "disruption" affect the complex and shifting bond between humans and things (Trentmann, 2009: 306). Barad's and Trentmann's assertions that breakdown equates to machine agency are useful, but they fail to attend to the range and detail of the mechanical gestures of different forms of breakdown. The theorists above, like Virilio with the accident, have essentially blackboxed breakdown as a revelatory event without any concern for the variety of expressions and affect different forms of breakdown produce. In the glossary of *Pandora's Hope* (1999) Bruno Latour defines blackboxing as:

An expression from the sociology of science that refers to the way scientific and technical work is made invisible by its own success. When a machine runs efficiently, when a matter of fact is settled, one need focus only on its inputs and outputs and not its internal complexity. Thus

paradoxically, the more science and technology succeed, the more opaque and obscure they become.

(Latour, 1999: 304)

Latour himself posits breakdown as a way of taking apart blackboxed ideas (1999: 183). But here, breakdown itself is blackboxed and needs further investigation.



detail of *Homage to New York* leaflet (1960)

vii. Auto-Destruction and Breakdown

Artists working with breakdown are discussed in my methodology and of those cited above, the work of Jean Tinguely and Karl Heinz Jeron certainly also engage with forms of breakdown in their practice. Tinguely's *Homage to New York*, 1960 is one of the most notorious examples of his "self-constructing and self-destructing works of art" (Tinguely, 1960). In the accompanying leaflet for this event at MOMA, *New York Times* art critic, Dore Ashton describes Tinguely's art as "an art of artlessness and imperfections – more human than machine" (Tinguely, 1960). Interestingly, the controlled self-destruction that was meant to occur itself broke down and the rapidly

burning machine was doused by a New York firefighter (Wolf, 2011). This breakdown of breakdown, its power of escape, is central to Gustave Metzger's concept of Auto-Destruction. Metzger's second manifesto published in 1960 defined Auto-Destructive Art as: public, time limited, and self-disintegrative (Metzger,



Metzger, *Auto-Destructive Art, Demonstration*, South Bank, London, 3 July 1961

1960). In stating that “Auto-destructive art demonstrates man’s power to accelerate disintegrative processes of nature and to order them” (1960) Metzger is clearly engaging with the entropic concerns of science fiction writers of the period such as Brian Aldiss and J.G Ballard as well as political debates surrounding nuclear proliferation. Metzger’s own *Auto-Destructive Art, Demonstration*, performed on the South Bank, London, 3 July 1961. Reveals a different persona and relation to breakdown to Tinguely (Wilson, 2008: 190). Metzger’s paramilitary attire is more suggestive of protest than vaudeville. In his 1964 manifesto *On Random Activity in Material/Transforming Works of Art* Metzger highlights the escape of the auto-destructive artwork from the artist:

At a certain point, the work takes over, it is in activity beyond the detailed control of the artist, reaches a power, grace, momentum, transcendence...

(Stiles & Seltz, 2012: 473)

It is at this point that my practice diverges from the auto-destructive. In acting as a repair-man I continually attempt to bring the machine back from the brink of self-

destruction. In holding the machine in a temporal loop of near-function and near-breakdown not only am I able to examine the modes of breakdown in more detail but our bodies become more intimately interlinked.

viii. Avoiding ‘Good’ and ‘Bad’ Anthropomorphism

In his review of *Love Machines* Matthew Bowman notes that:

Mechanical breakdown doesn’t so much serve to cast heightened attention on his machines as to provoke reflection on our own fragility.
(Bowman, 2017: 34)

This form of anthropomorphic mirroring is central to a process that both connects and separates the machine from the human. In *Five Bodies, re-figuring relationships*, Sociologist of the body John O’Neill defines anthropomorphism as follows.

Anthropomorphism - attribution of human form or character
1. Ascription of a human form and attributes to the deity
2. Ascription of a human attribute or personality to anything impersonal or irrational.
(O’Neill, J. 2004: 2)

This approach defines anthropomorphism as an exterior force applied by the human onto the nonhuman. O’Neill examines relationships between the body and politics, economics and society (2004: 3) noting how anthropomorphism is in constant use as a form of political control (2004: 46). In doing this O’Neill highlights that one of the central debates in the field of anthropomorphism is not about its function but its validity.

This polemical discussion of anthropomorphism is debated at length in the field of ethology. John S Kennedy in *The New Anthropomorphism* (1991) is typical of many

behaviourists¹³ in characterising anthropomorphism as a disease (Kennedy, 1991: 160). Whereas Gordon Burghardt states anthropomorphism is a valuable tool¹⁴. Following Burghardt, Marc Bekoff, Professor Emeritus of Ecology and Evolutionary Biology at the University of Colorado, has foregrounded the role of a personal relationship in his studies of animals. Bekoff's *Minding Animals* (2002) is a good example of the principles behind what he calls *biocentric anthropomorphism* a concept that refuses the human-animal dualism of behaviourist ethology (Bekoff, 2002: 186). Similar debates are occurring in New Materialist thinking. In many cases anthropomorphism is treated sceptically, Quentin Meillassoux is typical in stating he is opposed to anthropomorphism for its overlaying of subjective ideas onto matter (Dolphijn, & Van der Tuin, 2013: 79). However, such warnings about anthropomorphic thinking are not universal. Political theorist Jane Bennett asserts that anthropomorphism can be used to reveal connections across nature and culture (Bennett, 2010: 99).

The purpose of this research, however, is not to enter debates about the usefulness or validity of anthropomorphism but rather to examine what is revealed about human-machine relationships at moments of breakdown. I have selected the work of researchers Sherry Turkle and Lisa Caporael as a starting point for this because of their involvement across the sciences and the humanities. Turkle, Founder and Director of the MIT Initiative on Technology and Self, based her examination of the computer as a part of human society *The Second Self* (1984) on her observations of students and scientists working around MIT's artificial intelligence lab. She noted the move towards paralleling brain function and machine programming in the 1980s.

AI, particularly in the form of "connectionism," borrowed biological metaphors in developing its view of mind as emergent system. Many were shocked when Minsky spoke of the "mind as a meat machine" because they envisaged computational machines as symbolic information processors. But when the machine is viewed as a

¹³ A summary of the historical development of the concept of behaviour and its main proponents can be found in: Johnston, James M. & Pennypacker, H.S. (2010). *Strategies and tactics of behavioral research*. Hillsdale, NJ: Erlbaum Associates. pp. 21-24

¹⁴ For more detail see Burghardt, G.M. (1991). "Cognitive ethology and critical anthropomorphism: A snake with two heads and hognose snakes that play dead". In Ristau, C.A. *Cognitive ethology: The minds of other animals*. Erlbaum. pp. 53-90

biologically resonant emergent system, the same comment can seem almost commonsensical. It all depends on what kind of machine the mind's meat might be.

(Turkle, 2005: 351)

Turkle's recognition of "connectionism" is also central to Lisa Caporael's paper *Anthropomorphism and Mechanomorphism: Two Faces of the Human Machine*, 1986. psychologist Caporael examines anthropomorphism and mechanomorphism in machine-human relationships. In parallel with Derrida's concept of anthropomorphic taming (Derrida, 2008: 37) Caporael argues that anthropomorphism results from a "default schema" applied to phenomena, including machines that a perceiver finds otherwise inexplicable (Caporael, 1986: 213). Crucially Caporael's paper locates anthropomorphism not as a human projection but as a line of interaction (Caporael, 1986: 218). It is this notion of lines of connection that I develop further from Minsky's work at the MIT AI lab. Set up in 1963 It became a centre of fictional and scientific accounts of AI. Arthur C Clarke and Isaac Asimov regularly visited Minsky and works such as Clarke's *2001 a Space Odyssey* (1968) and Asimov's *I Robot* (1950) should be read as parallel texts to Minsky's *The Society of Mind* (1986) in exploring the connections between human (and machine) minds. By attending to this flickering relationship between speculative fiction and scientific research via the constant recombination of artist and machine at work in my practice it is possible to draw out a process of machine-human relation that moves beyond the polemics of anthropomorphism. My practice also nudges at the Vitruvian relationships between artists and machine art described above. The machines of *Breakdown* push and pull at the artist moving him into the space they create. Through their subtle and unstable relationships with both artist and audience they not only allow mechanical breakdown to be understood as separate from the accident but also unpack the stereotyped notions of breakdown prevalent in recent theory. In examining the gestures of breakdown expressed by my machines it has been possible to refine Barad's agential realist notion of entanglement to show how bodies form around the mechanical gestures of creaking joints, burning motors and cessation.

1. THE MACHINES

- 1.1 Introduction – The Machines of *Breakdown*
- 1.2 Breaking-Machines
 - 1.21 The *Approaching-Breakdown-Machine*
 - 1.22 Video-Machine
 - 1.23 The Remade *Breaking-Machine*
 - 1.24 The functioning *Breaking-Machine*
- 1.3 The Art Machine
- 1.4 The Unstable Ensemble
 - 1.41 The Historiality of Materials
 - 1.42 Linkages and Kinematics
- 1.5 Mechanical Retelling
- 1.6 Conclusion – Strange Situations

1.1 Introduction – The Machines of *Breakdown*

Early in his work on mechanology *On the Mode of Existence of Technical Objects*, Gilbert Simondon introduces the idea of conflict and change. In defining the machine in terms of the *element*, the *individual* and the *ensemble* (1958: 8) he notes the linear development of its involvement with humanity. He defines this as a process that moves from optimism, through an adversarial phase¹⁵, towards negentropy¹⁶ and stability.

The machine is something which fights against the death of the universe; it slows down, as life does, the degradation of energy, and becomes a stabiliser of the world.

(Simondon, 1958: 9)

Asimov's collection of short stories *I Robot*, 1950 follows a similar trajectory. It ends with *The Evitable Conflict*, in which a group of super computers called the Machines take care of an unknowing humanity.

Perhaps how wonderful! Think, that for all time all conflicts are finally evitable. Only the Machines, from now on, are inevitable!

(1950: 206)

Clearly Asimov's ending is not necessarily meant to be as utopian as Simondon's, however, the elements of conflict and stability set up in both narratives reveal a key to the Twentieth Century understanding of both the makeup of a machine and its relationship with the human. Simondon goes on to use his macrocosmic theory to describe the inner workings and evolution of the individual technological object. Again, he traces progress from conflict to a point he calls the concrete mode:

¹⁵ These early phases are clear in Charles Babbage's, *On the Economy of Machinery and Manufactures*, 1832 in which he often sets the worker and the machine in opposition. In Chapter XXVIII *On Combinations amongst Masters or Workmen Against Each Other* Babbage details a number of examples by which the striking worker leads to mechanical innovation that in turn reduces the workers role from skilled to unskilled (Babbage 1832: 245-8). Babbage's mechanical innovations thus become a form of social control over the worker. Similarly, Andrew Ure in *The Philosophy of Manufactures*, 1835 repeatedly lauds the reliability of the "self-acting machine" (Ure, 1835: 14) over what he calls the "handicraft caprice" (1835: 9) of the drunken worker. (1835: 9, 180, 181, 316, 354, 414, 415, 419).

¹⁶ Simondon characterises negentropy as a "stabilizer of the world", a force of organisation and information in opposition to the degradation of energy and dissolution of the universe. (1958:9)

It tends towards a state at which the technical being becomes a system that is entirely coherent with itself and entirely unified.

(1958: 16)

The corollary of Simondon and Asimov's schema, is the movement of the machine from a contained element, a discrete tool, towards the ubiquitous, unbounded *ensemble*. By the end of *I Robot* for example, the *Machines* are referred to in capitals denoting their new status. They are also simultaneously presented as individual and as aggregate (omnipotent positronic minds). Bernard Stiegler has recently taken this idea of the fully integrated machine a step further. In *Automatic Society* (2017) his discussion of automaticity completely ties the negentropic forces of technology and life together (Third Rail Quarterly, 2015).

This chapter will examine how the machines I have made for *Breakdown*, fit within the narratives provided by Asimov and Simondon, and undermine them. It will look at how, in breakdown, the machines of this research range between Simondon's conflicting *individuals* and stable *ensembles* and how the conflicts of their mechanisms are dynamic producers of material language. Throughout the chapter the speculative-machines of *Breakdown* will also be discussed as *breaking-machines*, art-machines, desiring-machines, retelling-machines, and unstable-ensembles. It is not intended that any of these notions of the machine should be understood as correct, nor that they necessarily co-occur. Rather, following Bohr's theories on indeterminacy, discussed by Barad, that they are momentary phenomena brought through intra-action between observer and observed (2007: 340). Taking this approach, it becomes irrelevant to ask, "what is a machine?" instead this chapter will seek to define the *breaking-machines* of this research in terms of a series of spatiotemporal relationships.

These characteristics will be discussed in detail in the following sections.

1.2 *Breaking-Machines*, will present a new type of machine enacted by this research which exists on the verge of breakdown.

1.3 The Art Machine will look more closely at the process of function-in-breakdown as a characteristic of artists' machines that present an ongoing flow of near breakdowns.

1.4 The Unstable Ensemble will look at the machines of *Breakdown* in terms of their parts and linkages. It will examine how these parts and linkages can be understood as reaching beyond the body of the machine.

1.5 Mechanical Retelling will take its lead from Guattari's ritornello to set forth the idea that the parts and linkages of the machine are productive of a series of communicative expressions and gestures, through function and breakdown.

1.2 *Breaking-Machines*

The machines of *Breakdown* belong to a typology of machine not discussed by Simondon nor Lafitte in their pioneering work on mechanology¹⁷. These *breaking-machines* are constructed in such a way as to make their function to explore breakdown. But also, in order that they can be displayed as artworks in a gallery context, their function is to stretch this moment of breakdown over as long a period as possible. As Matthew Bowman has noted in his review of my exhibition *Love Machines*, 2017:

These works are not fundamentally auto-destructive in the manner of Gustav Metzger or Jean Tinguely. Rather mechanical failure betokens a relatively scant knowledge of construction techniques, allied with a requirement to work with barely satisfactory materials at hand.

(Bowman, 2017)

These breaking-machines sidestep the notion of the auto-destructive and, indeed, in constantly shifting between states of function, breakdown and re-function they question the relationship of the machine to function at all. This state of function-in-breakdown has been one of the biggest challenges in terms of construction for the machines of *Breakdown*. To fulfil this role there have been three main sub-types of *Breaking-machines*.

1.21 *The Approaching-Breakdown-Machine*

This type of machine hovers on the verge of breakdown for a long period of time, exhibiting symptoms of breakdown without failing. Strictly this machine is fully functional. In the context of this research this type of machine can be employed in a similar way to thought experiments dealing with the unreachable event horizon of a black hole. In Einsteinian physics the event horizon is a point that an object cannot pass and beyond which no information can be gleaned (Chaisson, 1990: 213). However, thought experiments can be employed to posit events beyond the horizon based upon what occurs upon its approach¹⁸. The *approaching-breakdown-machine*

¹⁷ See: Simondon, G. (1958/1989). *Du mode d'existence des objets techniques*. Paris: Aubier, Lafitte, J. (1932/1972). *Réflexions sur la science des machines*. Paris: Vrin.

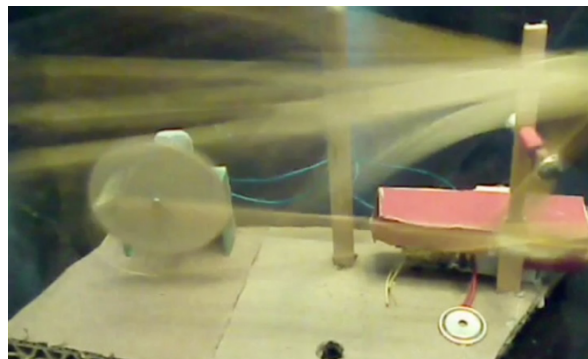
¹⁸ An example of this kind of thought experiment can be seen in Stephen Hawking's lecture *Into a Black Hole* (2008)

has another aspect. It is most commonly encountered in museum and gallery collections where it is maintained by conservation (repair) and by limiting the time it can function. The 2017 Tinguely retrospective at the Stedelijk, Amsterdam is a good example of the strategies used to manage the *approaching-breakdown-machine* in the museum context. The exhibition preview and press releases (Stedelijk, 2017) for *Jean Tinguely - Machine Spectacle* pay special attention to the managing of breakdown, through “intensive” repair work and the rationing of activation to 5-60 minute intervals. In the case of more fragile machines further protections were added. For example, *Gismo* and the drawing machine *Méta-Matic no.10* were only activated through the aegis of a professional restorer on six dates throughout the five-month run. The curatorial balance between preservation and spectacle runs an interesting parallel with the mechanical equilibrium sought by the *approaching-breakdown-machine* itself. Art writer and curator Anna McNay, in her review of the exhibition, noted that the machines at the Stedelijk had been “museumised” (2017) a condition which she believed would have brought sadness to Tinguely. In lending museumised machines a melancholic aspect she is keying into an idea expressed by Bruce Chatwin in his 1988 novel *Utz*. Here Chatwin’s protagonist writes:

‘An object in a museum case’, he wrote, ‘must suffer the de-natured existence of an animal in the zoo. In any museum the object dies – of suffocation and the public gaze – whereas private ownership confers on the right and the need to touch.’

(1988: 20)

The removal of haptic pleasures is an important factor here. When observing, for example, the workings of *Machine 16*¹⁹, each temporary seize is a call to action, an urge to touch. There is a macabre seduction in this urge; a haptic compulsion coupled with



Machine 16

the pleasurable frisson of fear and disgust one feels when a seemingly dead pigeon

¹⁹ For more information on the workings of *Machine 16* see appendix 2 [Breakdown Manual](#)

twitches in your hands or when the Terminator's red eye blinks back to life. However, in a gallery or museum context such haptic interruptions are either forbidden or highly mediated. Even in my exhibition *Love Machines* (2017)²⁰ where visitors were given permission to gently interact with the machines there was an inbuilt tentativeness in the curiosity of their interactions. In any case, the functioning *approaching-breakdown-machine* will always move back from the event horizon of breakdown, releasing the viewer from the demand to touch. In this way, the *approaching-breakdown-machine* sets up a sporadic mechanical repetition of attraction and repulsion with the viewer, a cross-rhythm²¹ to the repetition of function. There is also frustration here, the function of *approaching-breakdown-machine* is both unfulfilling and unfulfilled. For *Machine 16* to run smoothly is a failure and to breakdown is a failure. It is a machine trapped in a function separated from production (breakdown) it is self-alienating.

1.22 Video-Machine

Several of the machines of *Breakdown* exist as digital videos. These display the close observation of a machine as it breaks down. Recorded on dv tape the *video-machine* is presented in the gallery on a continual loop. *Machine 6* is an example of this, a video of a violently spinning machine which recorded its own breakdown over a matter of seconds. Each loop of the video instantaneously and continually returns the machine to function. This second type of *breaking-machine* is a mechanical ghost. In the *Iliad*, Achilles is visited by the ghost of Patroclus who begs him to perform the burial rites that will release his spirit.

Bury me as quickly as may be, let me pass through the gates of Hades. The souls, the images of dead men, hold me at a distance, and will not let me cross the river and mingle among them, but I wander as I am by Hades' house of the wide gates.

(Homer. & Rieu, 1984: 414)

²⁰ See appendix 2 *Breakdown Manual* for more detail.

²¹ "Cross-rhythm is a rhythm in which the regular pattern of accents of the prevailing meter is contradicted by a conflicting pattern". (Randel, 1986:216)

This narrative of the ghost as a wanderer trapped between worlds, unable to pass on without closure has become common in literature and horror cinema. Here in the case of the video-machine these elements of repetition without closure and isolation are translated into mechanical form. This process of overlapping of mechanical, photonic, and supernatural bodies is discussed in Eugene Thacker's article "FCJ-018 Living Dead Networks" which explores correlations between the worlds of information technology and epidemiology via the language of the Zombie film. For Thacker, the *Living Dead Network* (a translation of the biological into the informational) is a paradoxical form that "exceeds and even supersedes the 'bare life' of the organism" (2005). The *video-machine* has the same zombie qualities, relentlessly repeating in destruction. It is an existence that is absurdly visceral in exactly the way Thacker asserts, it is:

a 'living death' in which the biological is exclusively
biological, in which the self is nothing but a body.
(Thacker, 2005)

In turn, the *video-machine*, in its ghostly form, is more mechanical than the machine, repeating the repetition of its breakdown.

Essentially the looped *video-machine* also functions much like an extended gif or slow-motion replay. The most mundane of digital ghosts, the gif loops an event most often for comic effect, while the slow-motion replay is commonly deployed for "truthfulness" a laying out of what Sheena Rogers in "Truth, lies, and meaning in slow motion images" calls the "WHO...WHAT, WHERE, WHEN and HOW OFTEN." (Shimamura, 2013: 155) of an event. This use of slow motion is entirely bound up with the search for and celebration of causality. It unravels the mystery of, for example, whether the ball was in or out and revels in the skill of the player. However, as Rogers also notes, in cinema slow-motion is often used to suggest a shift from reality to an internal state of mind²² or alternate reality (2013: 151f). Indeed, slow-motion can be such an emotive form that I have avoided in the making of *video-machines*. Instead the real-time repetition of *Machine 6* deals less with

²² Slow motion is often used as an indicator of love, now so over used that it has become comedic see for example, *Naked Gun*, 1988

causality or celebration and more with the visceral mechanics of breakdown as it happened; morbid and enervating endlessly rerunning the breaking process.

1.23 The Remade *Breaking-Machine*

During the exhibition of works from this research in *Denis ex Machina*, 2017 and *Love Machines*, 2017 one of the most important elements of both exhibitions was the process of mechanical breakdown and live repair. This action was considered unusual by gallery visitors who assumed I was not the artist but working as a technician. As noted above, the presentation of media art prone to breakdown forces the creation of new strategies for a gallery or museum. A work that has ceased to function is often left in that condition while the exhibition is open or marked with a sign informing the public of its failure. Either state: darkened and still, or labelled and grave like, separates it from the other functioning pieces, marking it as lesser. It is unusual for repair to be effected while the exhibition is open, more often this will occur behind the scenes by a functionary of the gallery or museum. These strategies highlight a normative approach to function and dysfunction and a strict delineation between these two states. However, the act of making and displaying a machine which breaks down and is repeatedly repaired over the course of the exhibition provides a new apparatus for the understanding of breakdown. This shift is not only apparent in the sidestepping of normativity but also in the involvement of the artist in a new role that is performative but not performance. This is unlike the live performances of artists such as Stelarc, Sean Dowers or Pierre Bastien whose work reveals a process of performing with, or using, mechanical devices as extensions of their practice. In all three cases their schema is essentially Vitruvian in format, the artist is presented as central to production while employing mechanical extensions or instruments. In contrast to this, the artist-machine relationship set out in *Denis ex Machina* and *Love Machines* is diffracted (both dispersed and deflected). By presenting artist as a peripatetic repairperson or tinkerer, moving through the space in response to the actions of the machines this Vitruvian hierarchy is broken down and confused. In this confusion, the focus shifts from an understanding of: artist, viewer, gallery space and art-object as distinct bodies. Instead the focus turns to the language of breakdown (and function) which materialises new bodies from moment to moment. This process of breaking and remaking highlights the role of the

connections between machine, artist, institution and viewer in bringing those bodies, temporarily, into being. There is a darker side to this relationship. In *Love Machines* a rapport develops between artist and machine in which the technical object is suspended in what amounts to an abusive relationship. The machine, through constant tinkering, is enslaved to the artist's care and kept in a condition of meagre function. Indeed, the machines' poor manufacture creates a "neediness" that allows the artist to, not love them to death but, keep them hovering at that point. This symphorophilic theme has been explored in film and literature with John Fowles, *The Collector*, 1963 and Stephen King's *Misery*, 1987 standing as grisly human to human examples of this obsessive control. The same combination of love and control is central to Asimov's "The Evitable Conflict" in which humanity is eventually "cared for" by the *Machines*.

1.24 The functioning *Breaking-Machine*

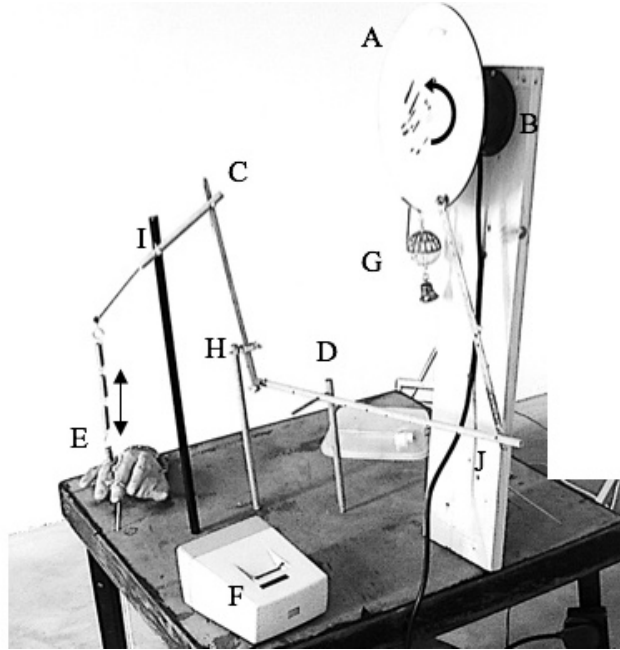
Even the three modes of investigation noted above are unstable. The machines of *Breakdown* often merge into one another combining the subtypes listed above. Eventually, when these *breaking-machines* finally fail, they are reconfigured into new *breaking-machines* through the actions of circumstance and the artist. As such their status as individuals is always temporary, they are unstable *ensembles*.

*Machine 18 (Mechane)*²³, 2016 is typical of a *breaking-machine*. It is constructed of parts from earlier machines and found objects including a Budgerigar bell (G), a latex hand (E) and a 1970s slide-viewer (F). It was made in response to a poem by Aristophanes deriding the use of the Deus ex Machina (both a narrative and a physical machine) in Ancient Greek Theatre:

when they don't know what to say
and have completely given up on the play
just like a finger they lift the machine
and the spectators are satisfied
(Aristophanes, *Thesmophoriazusae*, 411 BC)

²³ Full documentation and video of *Machine 18* can be found in appendix 2 [Breakdown Manual](#)

Mechane confuses the easy solution that Aristophanes despairs of. Rather than a machine that lifts like a finger it is a machine that lifts a finger. *Mechane* exhibits a mechanical process of cumulative error common to the party game *Chinese Whispers* in which a phrase is passed from teller to teller breaking down in the process. This corrupted retelling occurs both in *Mechane*'s



Machine 18 (Mechane)

response to Aristophanes but also in terms of its mechanical linkages. This begins with the smooth revolution of the motor (B). The revolution is translated from cam²⁴ (A), through a series of revolute joints (J), (D), (C), (I) and one prismatic²⁵ joint (H) to the finger (E). This finger is eventually, and jerkily, raised by a creaking contraption of wood, metal and plastic. The extended series of mechanical joints and levers that make up the machine's mechanical linkage are instrumental in making *Mechane* an approaching-breakdown-machine. However, *Mechane*'s linkages are not only mechanical. *Mechane* is also equipped with a live video feed, displayed on a television propped underneath the table, through which the machine receives and displays visual, electronically coded, information of its function. This reflexive video transmission forms a part of the linkages of the machine and is, like the mechanical linkages susceptible to forms of breakdown.

The linkages at work in *Mechane* also have a temporal quality brought about through the process of breaking and remaking. It is through this process that these linkages can be seen to connect and form other bodies: the artist, the gallery, the viewer. *Mechane* has been rebuilt several times, many of its parts originally coming from an earlier work *Blondin's Apparatus*, 2016 (see chapter 2) have been replaced or repaired over time. In a response to the classical paradox of Plutarch's, *The Ship*

²⁴ For more information see the glossary in appendix 1

²⁵ See glossary

of *Theseus*²⁶, the machines of *Breakdown* are rematerialised from moment to moment (Barad, 2007: 155). They are one and many.

1.3 The Art Machine

In declaring art as a desiring machine (Deleuze and Guattari, 1983: 32) Deleuze and Guattari cite César's crushed car sculptures, the *Compressions*, and Arman's burnt violins. Both series of works were made throughout the 1960s while the artists were members of the Nouveau Réalisme group. Deleuze and Guattari highlighted that art often takes advantage of the desiring machine's property of continual breakdown and that it "interfere(s) with the reproductive function of technical machines by introducing an element of dysfunction." (1983: 31). It is interesting that they chose as their exemplars two works that present the technical machine rendered totally inert and unusable. César's crushed cars present a moment of mechanical violence arrested. The compression of the title refers not only to the action of one machine on another or the junctions of chrome, paint and plastic but also to the compression of an extended temporal process into a material art object. Through compression the violent clangour of the crusher is lessened. It is as if the viewer is being presented with a highly-compressed gif, a tiny vibrating moment in time. Jean Tinguely, also a member of the Nouveau Réalisme group is not mentioned in *Anti-Oedipus*, however, in 1988 Guattari is reported as describing Tinguely's machines as "devices that try to hook into the cosmos, to enter into communication with the inaccessible" (Berardi Bifo, Stivale and Mecchia, 2008). Later in *Chaosmosis* (1992) Guattari returned to Tinguely's machines to draw out the way in which the mechanical object plays with other structures:

A machine brings into play several simultaneous structures which it pervades. The first structure includes at least one element that is not operational in relation to it, but only in relation to a second structure. It is this interplay which Tinguely presents as being essentially joyful, that ensures the process of deterritorialization of the machine, as well as the position of the mechanic as the most deterritorialized part of the machine.

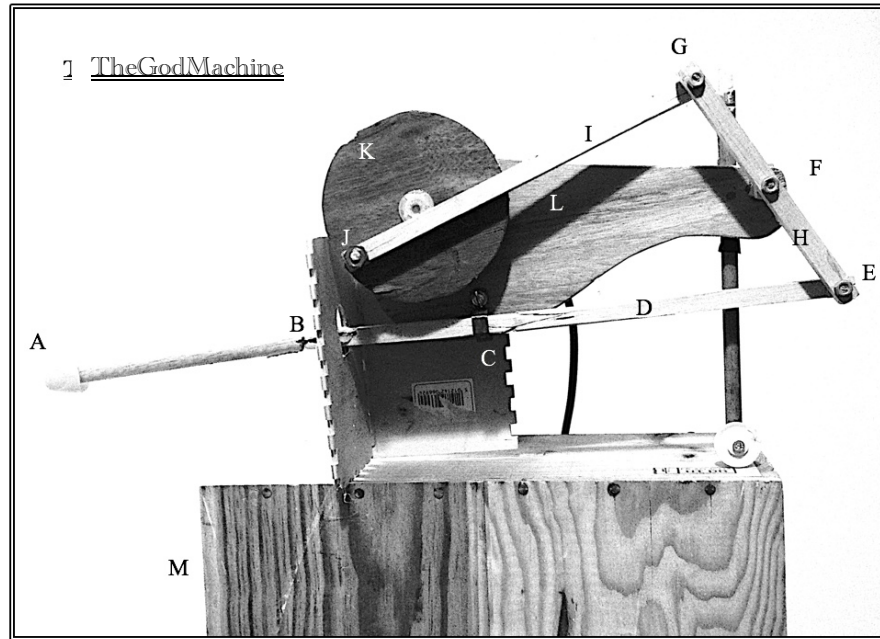
(2009: 104)

²⁶ Plutarch presented the paradox of Theseus in his *Lives* 75AD. in which he asked the question that if Theseus's ship had returned having had all its constituent parts replaced, was it still the same ship that had set out many years before? (Classics.mit.edu, 2017)

In both the cases of César's complete removal of function and Tinguely's connecting schizo-function Guattari lays the groundwork for an Art Machine that connects through breakdown.

In the context of the art gallery this connective role for the machine is pushed to the fore. Here, the machine removed from its usual territories of manufacture, transport and communication is made to develop new contacts and linkages. In this context, the machine can be understood as an assistant to thought as typified by Erkki Huhtamo's concept of *Thinkering* (Parikka, 2012: 141) and the *Critical Making* methodologies developed by Garnet Hertz and Matt Ratto (Parikka, 2012: 147) or, as forging connections beyond the mechanical. Indeed, Bowman suggests that the breakdowns exhibited in *Love Machines* move our attention beyond the mechanical and "provoke reflection on our own fragility" (2017: 34). Just as the robots of Capek's *RUR*, once freed from work and slavery look to develop new structures, social and emotional, so art machines are impelled to do the same. Capek's robots and these art machines are involved in a process of breaking away from human control and reconnecting with the world (and the human). As Suzanne Verderber states in her introduction to Anne Sauvagnargues' book investigating the work of Deleuze, Guattari and Simondon:

An art machine is an "instance of real production" and
 "sundered from any human source."
 (Sauvagnargues, 2016: xiv)



Machine 26

Taking *Machine 26 (TheGodMachine)*, 2017 as an example we can see how the machines of *Breakdown* develop this role further. *TheGodMachine*, is a mechanism built of the most basic mechanical parts. A cam(K), cam shaft (I), levers (H)(D), revolute (or hinged) joints (G)(E)(J) and prismatic (or sliding) joints (C)(B) are supported on a basic open structure. It performs the mechanical task of transferring a circular movement into a, roughly, linear one. This is perhaps one of the most common mechanical linkages. *TheGodMachine*'s function is less clear. When exhibited in *Love Machines* (2017), a solo exhibition at the Minorities Gallery, Colchester, it performed no obvious task. This uselessness is true of many art machines including Horn's and Tinguely's. In removing themselves from utilitarian function, art machines demand new *contact-at-a-distance* (Shaviro, 2014: 61, 118, 147-148), they create new meanings and associations through their uselessness. What *TheGodMachine* reveals, however, is that this contact, is not merely enacted through the machine's lack of useful function but through its modes of dysfunction. *TheGodMachine*'s function is punctured by breakdowns, which lead to variations in its movement: stoppages, jerks and sounds. What separates it from Tinguely's art machines is the mildness of its breakdown. Where Tinguely's machines provide dissonant and even threatening expressions in their "joy" *TheGodMachine* has in common with all the machines of *Breakdown* a more subdued range of gestures. This new gentler gestural language of fluttering hesitancy, groans and creaks encourages close inspection and connection.

1.4 The Unstable Ensemble

And Tralfamadorians don't see human beings as two-legged creatures, either. They see them as great millepedes- 'with babies' legs at one end and old people's legs at the other,' says Billy Pilgrim.

(Vonnegut, 2000: 71)

Kurt Vonnegut's 1969 novel, *Slaughter House 5*, describes the strange situation of a human, unfixed in time, who meets an alien race which experiences all time simultaneously. Viewing the machines of *Breakdown* with Tralfamadorian eyes (via Barad), gives a new way of looking at Simondon's typology of the: element, individual and ensemble. While Barad's cut "a causal intra-action" (2007: 140) describes a moment of observation isolated in time and with its own causality, the Tralfamadorian viewpoint allows for multiple cuts to be piled up on one another. In this way one can acknowledge their separateness and connectedness simultaneously. *Machine 9 (Sound Activated Machine)*, 2015 provides an understanding of this entanglement of science fact and fiction. This machine was exhibited as part of *Compression Culture*, Benzie Building, MMU. It took the form of a camera attached to a monitor via a sound detecting circuit board. The camera powered up in response to the sound of the echoing space of the building. Once activated, because of its fluctuating power levels, it presented images that varied between incomprehensible static to glimpses of the building and its residents. As such architectural space, human presence, the timetable of the institution and the patterns of power variation were presented in a series of (unrecorded²⁷) gestures of disconnection and reconnection. A fictional observer, standing before *Machine 9* for the entire run of *Compression Culture*, takes on a Tralfamadorian viewpoint. Holding each cut in their mind, each an isolated but interconnected event, the fictional observer allows for an overlapping and blurring of reality. Returning to the element, individual and ensemble, rather than taking this machine typology, as Simondon does, as an evolutionary process towards a utopian ideal, the following sections will apprehend the machine as a transitory iteration of many states.

²⁷ *Machine 9* was not attached to any form of video recorder, the images it produced were live and fleeting.

1.41 The Historiality of Materials

TheGodMachine, like any machine, is made of parts. These parts are themselves not newly made but have featured in several artworks over the last few years.

TheGodMachine's central mechanism is a reconfigured found machine (a student work rescued from a bin). As an art machine, it first appeared in 2014 at *Monomania*, a one day festival exploring "the solitary creative experience" (Monomaniafestival.co.uk, 2017). It formed a part of a "Purposeless Experiment



Monomania, 2014. Installation shot of *The God Machine*, with drawings by Gustave Metzger

Laboratory" commissioned for the event. The mechanism allowed a camera to peek hesitantly around a corner at Sean Dowers' *Live Noise Transmission* (2014). The mechanism was sited next to an experiment table which sported left-over sketches made by Gustave Metzger. He and his assistants had used the space the previous week while preparing a show at Kettles Yard, Cambridge.²⁸ Later in 2016, a reconfigured version of *TheGodMachine* handed out business cards in a haphazard manner during Metal's Beach Hut event at the International Festival of Business. Its current form also partially features in a recent video *Deus* in which it repeatedly prods the artist's nose. (<https://vimeo.com/191867388>)

Like *TheGodMachine*, the machines of *Breakdown* carry with them a material historicity (Barad, 2007: 383) as artworks either through appearance in video works or their construction. In addition to this, relationships are drawn which move outside of the mechanical or electronic, connecting with other worlds. The tenuous linkage

²⁸ Appropriately, Metzger's Cambridge show [Lift Off!](#) showcased both his auto-destructive and auto-creative works such as *Liquid Crystal Environment* (1965, remade 2005).

that *TheGodMachine* has forged with the work of Gustave Metzger via its relic-like memorialisation is indicative of its material historicity which Barad argues, enfolds past, present and future with each iteration. Thus, *TheGodMachine* presents the view of a machine, not as a stable artefact with discrete boundaries but as an unstable iteration combining in each moment multiple trans-temporal connections.

1.42 Linkages and Kinematics

These connections can be further understood by returning to the machine's internal makeup, its linkages²⁹. As described in relation to *TheGodMachine* above, a mechanical linkage is an assembly of links connected to manage and direct forces. These links are connected by joints, the most common of which are revolute (hinged) and prismatic (sliding). A linkage in which one, or more, links are fixed, is called a mechanism. A machine in turn can be made up of one or more of these mechanisms under power. The study of motion and its cause within a machine is called Kinematics, a term first proposed by André-Marie Ampere in 1834 (Wright, 1896: 3) and developed by Franz Reuleaux in his *The Kinematics of Machinery: Outlines of a Theory of Machines*. Despite the title of his book, Reuleaux expanded Kinematics to cover "the study of the motion of bodies of every kind" (Reuleaux and Kennedy, 1896: 56). In doing so he suggested what this research shows, that a linkage is not only mechanical. The connections forged by the historicity of materials discussed in 1.41 reveal that any linkage extends beyond the body of the machine. This idea is further developed in the involvement of *TheGodMachine* in the making of the video work *Deus*. In this video work, *TheGodMachine* is mostly just out of the frame of the stationary video camera. Only a part of lever (D) and thimble (A) are visible as they slide and nudge the nose. In the context of the video *TheGodMachine* only exists through this gristly contact and the sounds of its straining mechanics, recorded by the video camera. The art-machine that is *Deus* is a node on an expanded linkage of motor force, nasal elasticity, electronic signals and gallery context. It is wrong to say the machine connects with the human but rather that linkages temporarily materialise the machine. In this way, the machine can be said to appear in a position along a series of linkages. This position is not stable, it can expand, contract and slide. Rather than searching for a definition of a machine it is better to concentrate on location and movement.

²⁹ For further information on mechanism design and linkages see (Tsai, 2001)

Returning to Simondon's typology of machines: the *element*, the *individual* and the *ensemble* the position of machines like *TheGodMachine* is again unfixed.

Simondon's description of the ensemble as a harmonising, negentropic force already seems optimistic given rising concerns in the twenty-first century about the economic and social dangers of AI and robotics.³⁰ Given this and the

Tralfamadorian standpoint described in section 1.4, one can understand

TheGodMachine as omnipresently blurring itself through all three categories simultaneously carrying with it notions of: optimism, conflict and friendliness.

Clearly this unstable understanding of the machine as a vacillating node on a linkage bears relation to Guattari's assemblage theory. In *Chaosmosis* (1992) Guattari extends Simondon's ensemble to encompass the machine's relations "which associate(s) it with man" (1995: 34) In doing this he is drawing together the dualities of machine and man into the world of fluctuating, fluid, territorializing assemblages set out in *A Thousand Plateaus* (1980).

1.5 Mechanical Retelling

A clattering of clogs upon the pavement; a rapid ringing of bells; and all the melancholy mad elephants, polished and oiled up for the day's monotony, were at their heavy exercise again.

(Dickens, 2012: 997-998)

I'll just die if I don't get this recipe. I'll just die if I don't get this recipe. I'll just die if I don't get this recipe.

(Stepford Wives, 1975)

Machines repeat. This is a recurring motif in Dickens' industrial novel *Hard Times* (1854). In characterising the factory machines as "melancholy mad elephants" he describes their actions using imagery of monotonous and unbroken routine (2012:

³⁰ Recent nonfiction works such as Peter Frase's *Four Futures*, 2016 and Martin Ford's, *The Rise of the Robots*, 2015 both examine the economic impacts of increasing mechanisation. This a concern also played out in fictional work such as the television series *Humans*.

3655-3657). Relentless repetition of machinery was a theme to be developed in the fiction of the industrial era. Fritz Lang's *Metropolis* (1927) uses the same ideas of mechanical repetition in its opening montage which prismatically overlay images of pumping pistons, cogs, cams and shafts. This idea is later reinforced in the scenes in which the mechanistic workers serve the great Moloch machine's relentless rote. Later in films such as *Stepford Wives* (1975) and *Futureworld* (1976) repetition in breakdown became the shibboleth that unmasked the machine pretending to be human. The machines of *Breakdown* provide something slightly different. Their repetition is neither as oppressive as Dickens's and Lang's characterisation of machinery, nor as dangerously revelatory as the horror, of the machine under the skin, explored in Seventies and Eighties science fiction films such as *Terminator* or *Saturn 3*³¹. Instead the range of repetitive expression of the machines of *Breakdown* might more aptly be described as, among other things: gentle, tentative and cautious³².

The type of reiteration exhibited by the machines of *Breakdown*, also displays a variation which separate them from the implacable repetition described by Dickens and Lang. This occurs either through the process of cumulative error, noted above, or through a less easily apprehended wider repetition which is set up by multiple degrees of freedom³³ within the mechanism. In kinematics 'degrees of freedom' are defined through the movement of joints. For example, a hinged joint would be said to have one degree of freedom as it allows movement in one direction. However, in a machine such as *TheGodMachine*, degrees of freedom are increased not only by the number of joints but also by play in the mechanism allowed by looseness and deformation in the links and components. This increased freedom sets up more complex repetitions that occur with every revolution of cam (K) and, also, with (for

³¹ *Saturn 3*, 1980, is a science fiction horror in which a robot becomes homicidal after linking with the mind of a sociopath. In a key scene, the robot wears the head of one of its victims to lure the remaining humans into the open. The horror of the junction between the supposed binaries of human flesh and metal machine is also a key feature of the robot ("cybernetic organism" *Terminator 2*, 1991) of the *Terminator* series.

³² I had a cat, now sadly passed, who would attempt to awaken either my wife or I by slowly extending a paw to brush our eyelids. She was so careful that this action would take minutes as the paw eased closer and closer. Sometimes when almost there, she would hesitate and withdraw a millimetre before advancing again. When contact was finally made, the touch was so gentle as to be barely, but definitely, felt. Watching her intense micro-action was like being held in a space defined by a soap bubble. A delightful refrain which must, eventually, move on.

³³ For more information on the term degrees of freedom see glossary (appendix 1)

example) every tenth revolution. At the same time, seizes and jams may cause asynchronous digressions. Thus, the repetitions of the machines of *Breakdown* often have a more musical quality in their restatements and digressions.

This musical repetition is explored by Deleuze and Guattari in their discussion of the ritornello, or little return, in *A Thousand Plateaus* (1980). Translated as “refrain” by Massumi the ritornello is described by Guattari as a reassuring territorialising repetition observed in birdsong or the comforting tra la la of a child singing in the dark (Deleuze and Guattari, 1987: 299). The machines of *Breakdown* act in a similar way, it is their vulnerability (openness). Through their mechanical vocabulary of ticking and chiming, of almost regular creaks and whirrs, jerks and revolutions they are involved in a similar marking out of space. It is also important to point out that this marking out is not a process of exclusion but of connection. As Anne Sauvagnargues points out in her examination of Guattari’s six machinic components, the machine refuses the idea of individual thought and replaces it with “a collective assemblage of enunciation” (2016: 188). In doing this she describes Guattari’s concept of the machine as connective force (2016: 190) developing a relationship between human and machine. This can, however, be taken further. As has already been suggested Donna Haraway’s statement the “the machine is us” (1991:180) this is more than a connection between discrete bodies. Rather, what we might call 'humans' and what we might call 'machines' are temporal materialisations among fully integrated linkages.

Returning to the ritornello Anne Sauvagnargues develops Guattari’s concept to bring together space and time:

Ritornellos express time less as it is lived (*vécu*) than as it is inhabited (*habité*), as bundles of sensory signs by which we extract a territory from surrounding milieus through consolidation and habit

(Sauvagnargues, 2016: 126)

In describing time in terms of inhabited space Sauvagnargues’ concept of time bears comparison to Barad’s cut. Whereas the cut can be understood as a discrete moment, disconnected from causality (Barad, 2007: 155) Sauvagnargues, through Guattari,

presents a notion of time as a temporary bounded area held together by repetition. This idea is further developed by re-examining the mechanical retelling of the machines of *Breakdown* in relation to the gif.

The gif is a software machine which, like Barad's cut, presents time as a moment removed from causality. Its rapid repetition of a short clip of video extracts it from narrative time. As the gif instantly loops narrative causality is broken down further and the viewer is involved in a moment without beginning or end. This is completely unlike the experience of cinema in which the expectation and fulfilment of consequence is central to its narrative.



Terminator 2, 1991

In the example presented here the cyborg endlessly tears the flesh from its mechanical arm. It is caught in a Promethean loop endlessly revealing and recovering. The gif, in presenting this endless return, breaks down time as sequential and represents as an uneasy space for habitation.

The machines of *Breakdown* offer a slightly different, refrain. Like the gif they repeat a moment, but it is a precarious repetition. Through breakdown they provide variation and the expectation of stoppage. In watching *Deus* for example the viewer is caught between the expectation that *TheGodMachine* will prod the artist's nose consistently and the expectation that the mechanism will jam or slip and miss. In playing in the space between repetition and failure the machines of *Breakdown* provide a corrupted retelling which in turn opens the potential of a moment outside the gif space, or rather that the gif space may shift. This is a repetition that develops and flows.

1.6 Conclusion – Strange Situations

Machines? Extension of man, integrating into himself, extension of social structures and integrating into them, they are, at all times, identical to ourselves. They are us; they are, like us, beautiful, and ugly, like us. To develop them, to construct them, is to construct ourselves.

(Lafitte, 1932/1972: 101)

Throughout the process of making machines for this research I keep coming back to images of me struggling to make, repair and record their actions. These images are often captured by the machines themselves and reveal the physical and mental contortions required when working with their non-standard materials and

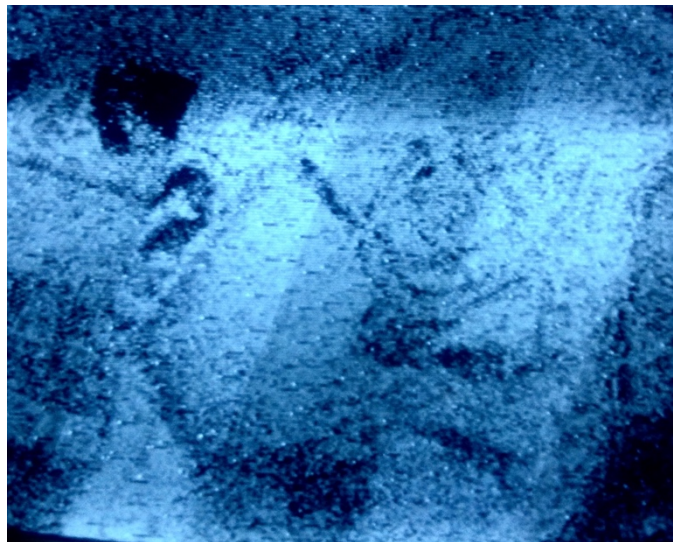


Image of the artist working on a machine, 2017

construction. The peering, rummaging and swearing recorded are symptoms of a close relationship between artist and machine. These symptoms increase with the added stress when displaying the machines in a gallery space. Here, the expectations of function and display demanded by public exhibition lead to anxiety as the conflict between idea and presentation is brought into play. In this chapter, Simondon's understanding of the machine as progressing from optimism through conflict to harmony is reassessed through Lafitte, Barad, Vonnegut and Sauvagnargues to come to a construction of the machine that is synchronously multiphasic.

Lafitte's statement above, like this chapter, appears to define machines without defining them. He does not say what a machine is, except to note its full integration into the human. Further he puts forward the idea that the machine is a part of a series of interlinked human, emotional and social structures. Unsurprisingly for the 1930s Lafitte's description is anthropocentric. He provides an anthropomorphised image of the machine extending from and mirroring the human. It is impossible to read his

statement without recalling the robot Maria of Lang's *Metropolis* (1927) or the robots of Capek's *RUR* (1920). It is easy to break down the hierarchy in Lafitte's statement to understand the machine as an actant in a network (Latour and Porter, 2009: 75) or an intra-active phenomenon (Barad, 2007: 340). If we reverse the human-machine relationship Lafitte describes above or do without his subjects/labels altogether what one ends up with is the idea of the machine materialising on a map of shifting structural relationships, a linkage.

As has been shown, this linkage is not only made of material parts (levers etc.) but of neurons, ligaments, art funding and citalopram³⁴. Returning to the example of *Deus* it can be understood as an assemblage of artist, nose, machine, video camera and other art videos such as Bruce Nauman's 1994 work *Poke in the Eye/Nose/Ear*, a piece in which he acknowledges the high-speed video camera is as much an actant as the 'human in a strange situation' (Art21, 2017). It is also clear that the notion of the machine and the human as fixed discrete bodies is unsatisfactory instead the *strange situation* needs to be the main area of investigation with its associations of place and condition. In *Breakdown*, the machine's roles of: breaking-machine, art-machine, desiring-machine and speculative-machine lay blurred one over the other, unfixed in time and space. This is where Sauvagnargues' spatiotemporal understanding of Guattari's ritornello can be developed. The repetitions of the machine are instrumental in signalling its position on a linkage in much the same way as Guattari's child in the dark reassures himself with the tra la la.

This definition of the machine as a fuzzy, signalling, spatiotemporal, phenomenon has implications for the discussion of breakdown and anthropomorphism in the following chapters. Firstly, if the signalling, demarcating, ritornello performs the machine and the human, then this has interesting implications for our understanding of how different forms of breakdown affect this signal. Secondly, classical anthropomorphism is built upon two presuppositions: that the human and non-human are separate, easily definable bodies and that there is a causal subject-object relationship between these bodies. However, if the binaries of machine and human

³⁴ This is not a completely arbitrary list, rather it includes some of the elements of the linkage that interconnects with the writing of this document.

are impossible to maintain, this will also affect our understanding of anthropomorphism.

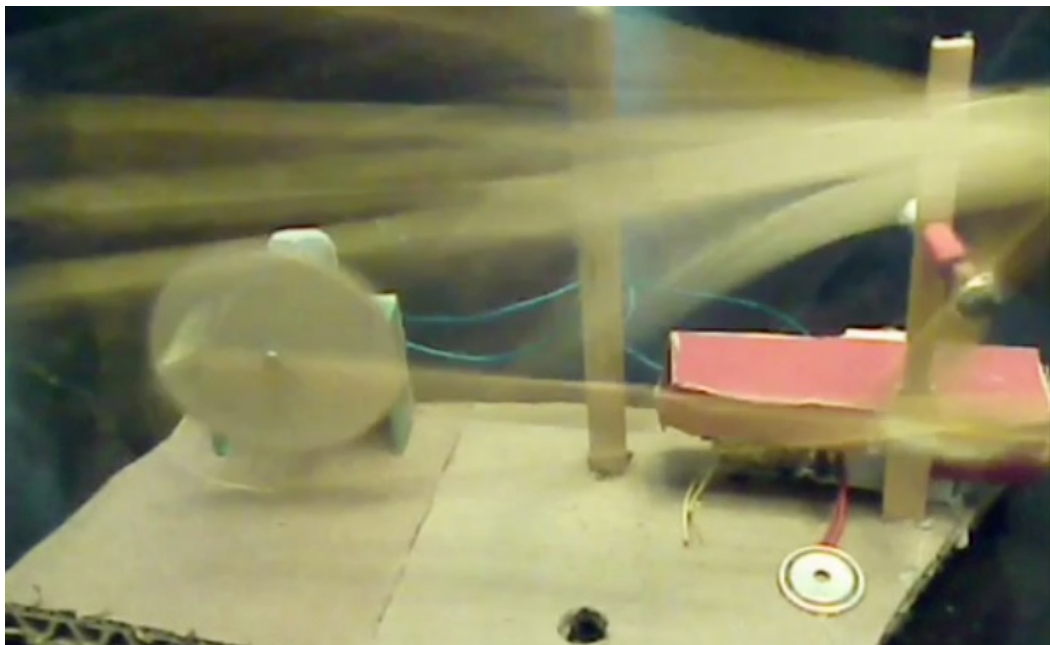
2. BREAKDOWNs

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2.1 Introduction: Observations of Breakdown, how Breakdown communicates.

This chapter will examine observations of the various modes of breakdown exhibited in the machines made for this research. Having separated breakdown from Virilio's *Accident* and its purely revelatory role, the purpose of the chapter is to counter the currently stereotyped idea of breakdown and to identify at least some of its modes of dysfunction as separate. To do this, the chapter will begin by examining breakdown as a symptomatic language of change which accepts the machine-human as an intra-acting body with unfixed boundaries (Barad, 2007: 823-4). It will then go on to challenge the normative understanding of breakdown and set out a new typology of breakdown in four parts: Play, Seize, Burnout and Cutting Loose.



Machine 16

This chapter is written with *Machine 16* (2016) sitting on the desk before me. *Machine 16* is a simple linkage of revolute and prismatic joints activated by a sound sensor. Upon detecting a sound, say the striking of the keyboard's spacebar, the electric motor performs several revolutions clockwise and counter clockwise. Its circular motion is translated into a spasmodic fluttering of the struts of a toy fan. Occasionally it jams. Throughout, this chapter will engage with the function and dysfunction of *Machine 16* and the other machines of this research in acts of "imaginative generalisation" (Whitehead, 1978: 5).

2.11 A Symptomatic Approach

There is only one point at which the gramophone interferes with both the work and the interpretation. This occurs when the mechanical spring wears out. At this point the sound drops in chromatic weakness and the music bleakly plays itself out. Only when gramophonic reproduction breaks down are the objects transformed. Or else one removes the records and lets the spring run out in the dark.

(Adorno, 2002: 275)

Adorno is sitting in the dark, this passage is used here not to examine the text or Adorno's thoughts on the effects of mechanical reproduction but to note the ways in which breakdown can communicate. It is dark, so Adorno is not likely to see the slowing of the record's spin. Visual communication, in this case, is so subtle at first that even in bright light it is unlikely to be noted. Aurally, the symptoms are felt more directly, as the spring unwinds the vibrations felt by the needle immediately lower in frequency. The spring is heading towards a state of rest and as it does so the aural breakdown is felt more keenly. For Adorno, breakdown is experienced in terms of a move away from a norm or ideal.

As discussed in Chapter 1, *Machine 16* doesn't have such strong normative values imposed upon it. Its sporadic motion, seizures and the play in its mechanics are 'normal', expected. As a piece of art, it blurs the boundaries between function and breakdown by not insisting on either. There has only been one point at which *Machine 16* has challenged this fuzzy state. During a studio exhibition in Essex it leapt from the shelf and landed on the concrete floor below, at which point I was summoned to sort out its transgression. In leaving the display zone of the shelf *Machine 16* had broken the rules in this group exhibition and had to be repaired and re-installed. As explained in Chapter 1 *Machine 16* is a breaking art machine (Sauvagnargues, 2016: 47) and desiring machine (Deleuze & Guattari, 1988: 42) functioning on two levels as an art work and as a machine.

In functioning through breakdown, *Machine 16* blurs the boundaries between these states and allows breakdown to be experienced free of some of the normative values associated with it. This chapter will begin by examining these moments of

breakdown in terms of diagnostic method, identifying: symptoms, and root cause. As well as being a common mechanical and medical approach, this is a process also used by Asimov's robot investigators Powell and Donovan and to some extent by the main protagonist Dr Susan Calvin (Asimov, 1950). In the short stories making up *I Robot*, the role of the three human investigators is to assess and correct robot behaviour at the moment of breakdown. To achieve this, they employ *robopsychology* (Asimov, 1950: 101) a discipline equivalent to human psychology which examines conflicts between the three laws of robotics³⁵. Indeed, throughout *I Robot* Asimov anthropomorphises machine breakdown in a variety of ways. Breakdowns are described in terms of religious mania in "Reason" (1950: 52-70), Cognitive dissonance in "Runaround" (33-51) and even hiccups (42). Although not directly equivalent, Asimov's three laws can also be understood as a machine version of Freud's Id, Ego and Superego. This continued confusion of human and machine will be discussed in detail in [Chapter 3](#). However, here it is important to note that the tools used here to understand machine breakdown are already highly normative, blurred and intimately entangled with their subjects.

2.2 The Symptoms of Breakdown as experienced by the Human

When examining *Machine 16* the relationships between the symptoms of breakdown and their root cause are neither straight-forward nor unidirectional. It is soon discovered that symptoms can also be causes. For example, vibration, or play, in the cam is a symptom of deformation of the card from which it is made, it is also the cause of misalignment of the cam shaft which leads to the revolute joints jamming or loosening. Obversely, the jamming of the revolute joints sends force back down the camshaft, deforming the cam further. This sets up a system-in-breakdown in which *Machine 16* is a temporary agglomeration of a series of junctions/junctures working together and in competition with each other.

³⁵ A robot may not injure a human being or, through inaction, allow a human being to come to harm... A robot must obey the orders given it by human beings except where such orders would conflict with the First Law.

...A robot must protect its own existence as long as such protection does not conflict with the First or Second Laws. (Asimov, 1950, p43)
See glossary for further information.

In December 2016 *Machine 16* was exhibited as one element of an installation *Denis ex Machina* (see appendix 2 Breakdown Manual p.233) in the project space of CANAL, London. During the two-month run I was regularly in attendance to repair and adapt the machines as they continually broke down. While not consciously intending to produce a performance piece, my presence became more than that of an artist-repairman or detached observer gathering data. Instead I became an integral part of a larger mechanism that was the installation. This connective relationship was made clearer by the architecture of the project space itself.

CANAL Project Space is a roughly cubic chamber one face of which is taken up with a floor to ceiling window. From outside it presents itself as a small stage, zoological enclosure or inspection window³⁶. Perhaps the main difference between the project space and these examples are that the viewer is free (and safe) to enter the space and become a part of the installation. In addition to this, an important aspect of the machines of *Denis ex Machina* is that they are, to some extent, self-regarding. Video cameras and other sensor devices are integral parts of their mechanisms. These present live feeds of, and responses to, both their own inner workings and immediate surroundings. Any visitor to the exhibition is ‘seen, heard or felt’ by the machines, becoming a part of the overall mechanism of the show. During these visits the various breakdowns that signalled themselves to me symptomatically via auditory, olfactory and visual communications are detailed in the following sections. In each case the sensory symptom will be treated as an element in a connective relationship of bodily and emotional exchange.

2.21 Auditory Symptoms

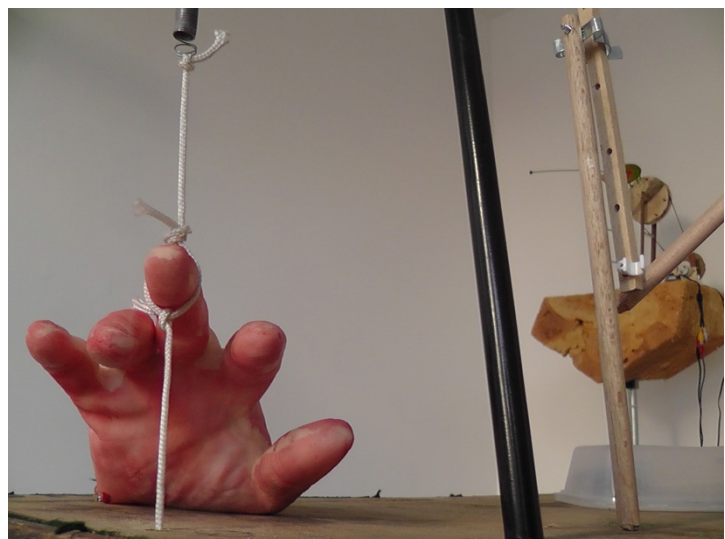
Artificially taken in isolation, the sound of the *Denis ex Machina*³⁷ interrupts the visual tendency to treat each element of the installation as independent and separate bodies. It gives at once a partial and a holistic experience of the functionings and breakdowns of the machine and human elements at play. As Trentmann and Latour suggest there is inherent in this process a sort of call and response (Trentmann, F. 2009: 297) between the grinding of a motor, creaking joint and the footsteps of the

³⁶ A glass or polycarbonate covered opening used to inspect the inner workings of parts of a machine that are especially prone to breakdown.

³⁷ Follow this link for an audio recording of the exhibition.

artist as he rushes to make a repair. However, in addition to this, the soundtrack suggests an aural-spatial reconfiguration at work. For example, the gentle crash of *Lift*'s belt drive falling to the floor (occurring at 1:03) caused immediate response (when I was present in the exhibition), or a delayed one via a phone call from the gallery owner. This delicate sound moved my body metres or miles from rest to a sort of anxious crouching as I attempted to fix the breakdown. Two further aural symptoms of breakdown which stand out in *Denis ex Machina* are the persistent groan of the straining motor of *Lift* (1:07 – 1:19 and 2:21-2:25) and the creaking joints of *Mechane* (2:54-3:03). In the case of *Lift* the sound was symptomatic of stress on the motor as it was forced to deal with forces outside of its normal working parameters. This would occur at moments of increased friction when a cotton bud was being pushed around a tight bend but also when the belt drive was being repaired. In each case stresses in one part of the machine's mechanism forced an aural signal from another. Less dramatically this is also true of *Machine 16* which emits a hum from its motor whenever a seize occurs in its cam assembly. Simultaneously the seize induces a cessation of, or arrhythmical sound from *Machine 16*'s flapping fan blades a juncture which marks a shift from smooth function to breakdown. Nevertheless, in both cases the groan acts as a call for attention, a signal of a physical *need*.

The creaking of *Machine 18*, *Mechane* is a slightly different phenomenon. This rather distressing sound emanates from a single revolute joint which forms part of the cam mechanism transferring the circular motion of the motor into the force that lifts a finger of the latex hand. This is a tightly dowelled joint



Machine 18, Mechane, detail

without lubrication and the forces expressed by its creak are also apprehended visually in the jerky way in which the finger rises. The sound here, is a symptom of

friction which will lead to heat build-up, further friction and wear but it is also the sound of function, a regular notification that the machine continues to transmit forces through its linkages. In this case, the cessation of sound would be a more telling symptom of breakdown, here it is more a possibility of breakdown that is expressed. The nuances of these breakdowns or *approaching-breakdowns*, and their relationship to *need*, show clearly that a subtler understanding of the machine-human relationship in breakdown is required than Trentmann's elucidating *disruption* (Trentmann, F. 2009: 70). Instead the auditory symptoms of breakdown (and function) as experienced by the human can be understood as part of a system of attracting forces which continue to dictate the orbits of human and machine bodies.

2.22 Olfactory Symptoms

Odours have a power of persuasion stronger than that of words, appearances, emotions, or will. The persuasive power of an odour cannot be fended off, it enters into us like breath into our lungs, it fills us up, imbues us totally. There is no remedy for it.

(Süskind, 2007: 82)

Unlike larger machines of metal and oil, the machines of *Breakdown* rarely generate detectable odours through their everyday function or breakdown. However, leaning closer towards *Machine 16* as it seizes, a faint smell can be detected coming from the motor. This is probably ozone (the word ozone is derived from the Greek *ózon* meaning to smell) produced by electricity arcing between the brushes and the commutator and temporarily producing O₃. As the brushes wear this arcing will increase and, if the motor jams or is overloaded, the brushes may heat up producing a burning smell (the degradation of the carbon itself), a symptom of more serious breakdown. In electrical components, a burning smell is often the sign of inescapable and irrevocable failure³⁸. Usually this abortive event is encountered when an electrical circuit is overloaded or wired wrongly, and is most likely to occur in the studio prior to exhibition. In this case, the root cause for failure can be traced to the ineptitude or carelessness of the manufacturing process, it is a failure that evokes shame in the artist.

As Süskind suggests, in the context of the machines of *Breakdown*, olfactory symptoms are of a subtle, fugitive and intimate nature. Detecting them calls for inclining oneself towards the machine, a gentle sniff, almost an act of devotion. This relationship is further coloured by the communicative nature of odour itself. While sound is the product of vibrations in the medium between the machine and the ear, olfaction is a chemical phenomenon produced by either the disintegration of the materials of the machine (as in the burning of the carbon brushes) or with the products of breakdown (ozone) (Guyton and Hall, 2006: 667-670). Because of this

³⁸ More information on the production of ozone by electric motors can be found by following this link: [Environmental Impact Of Arc Suppression](#)

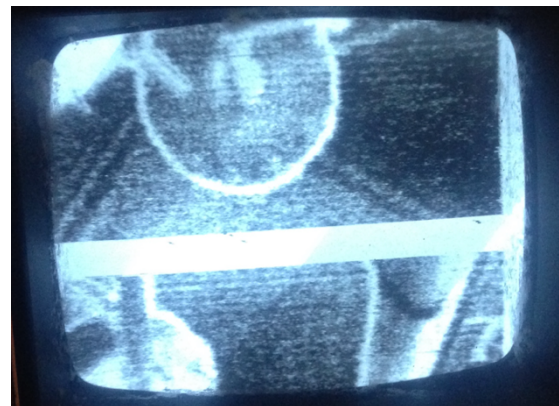
olfaction (like gustation) is a tactile sense occurring between the emissions of the failing machine and the olfactory receptors of the nose.

2.23 Ocular Symptoms - visual and video breakdowns

Visual symptoms of breakdown exhibited by *Machine 16* and the machines of *Denis ex Machina* initially appear both broader and less direct than either aural or olfactory symptoms. Visual symptoms of breakdown in *Machine 16* involve changes in the qualities of movement and their difference from a perceived norm. As discussed above, *Machine 16* sidesteps both the qualities of dynamic stability and true running in its function. Like Deleuze and Guattari's desiring machines (Deleuze & Guattari, 1988: 42) its function is inexorably bound up with dysfunction. However, its function/dysfunction is revealed in part through the visual symptoms of cessation and irregular movement.

Cessation, even for a moment, is perhaps one of the most striking visual symptoms of breakdown. It is a visual break which is felt as a loss by the human viewer, it causes feelings of anxiety and an urgent call to repair. Catharine Malabou's concept of destructive plasticity as opening "a deep cut in biography" (Malabou, 2009: 2) is useful here as it perhaps suggests a reason for the keenly felt response to this visual symptom. Interestingly, however, the visual apprehension of cessation is perhaps the least useful symptom in terms of the understanding of the root cause of breakdown in a machine, it gives little to no clue as to "what is wrong". On the other hand, what might be called symptoms of partial breakdown: irregular movement, stuttering, arrhythmia, vibration and out-of-true movement are easier to trace to specific root causes.

Several of the machines exhibited in *Denis ex Machina* incorporate CMOS cameras which regard and, via various television screens, display their own workings, the surrounding space and workings of other machines and humans. These camera assemblages present to the human observer an array of constantly fluctuating breakdowns in the



Machine 28, Self-regarding Machine, 2016, (detail)

form of the video picture. In many cases the image presented seems to bear only a fleeting resemblance to the thing represented. In fact, these images are often so degraded as to require work from the viewer to understand what is being observed. It is much like the experience of viewing a 12-week ultrasound without (or even with) the interpretation of a sonographer. In “Getting Real: Technoscientific Practices and the Materialisation of Reality” Karen Barad discusses the relationship between ultrasonic technology and the materialisation of the body in detail. She concludes “*matter is substance in its intra-active becoming – not a thing, but a doing, a congealing of agency*” (Barad, 2007: 210, author’s italics). The video breakdowns of *Self-Regarding Machine* show this *congealing of agency* at work while also creating both a separation between vision and cognition and a simultaneous demand to reconstruct reality. This is a demand made stronger by the viewer’s ability to look where the camera is pointing. This play between fictionalisation and reality is also discussed by Anne Sauvagnargues in *Art Machines: Deleuze, Guattari, Simondon* (2016). Here she notes the lack of reflexivity even in engaging with a reflection in a mirror.

Every image unfolds across a trajectory...an
uneven circuit is established, rapid though it may
be, of kinetic spatiotemporal dramatization
(Sauvagnargues, 2016: 53)

Machine 28, Self-regarding Machine presents a situation in which this *dramatization* is made even more obscure through the *eyes* of the machine.

There is something in this unknowing encounter which resonates with Deleuze’s use of the concept of love. John Protevi through his examination of love in *Anti-Oedipus* and *Thousand Plateaus* (Protevi, Patton ed. 2003: 183-194) characterises Deleuze’s concept as “schizo love” (Protevi, Patton ed. 2003: 188) which he describes as a multiple material exchange, a process of deterritorialisation and experimentation “leading to adventures” (Protevi, Patton ed. 2003: 13). In *Proust and Signs, 1973* Deleuze reveals another aspect of love. Here he describes the impossibility of understanding landscapes reflected in a lover’s eyes which are:

reflected from a viewpoint so mysterious that they become virtually inaccessible, unknown landscapes...to love is to try to explicate, to develop these unknown worlds which remain enveloped in the beloved.

(Deleuze, 1973: 7-8)

Love then for Deleuze is a struggle for understanding, a material exchange but one that is undertaken against the odds. Such is the encounter with the televisual productions of *Self-regarding Machine*, an exchange of charged particles and waves. To understand this exchange as an act of Deleuzian love it is necessary to look at how these video breakdowns are produced.

The video breakdowns encountered in *Self-regarding Machine* are mainly related to degrees of interference (from motors, atmospherics and barriers) and miscommunication of formats. In the case of *Self-Regarding Machine*, for example an integrated CMOS spy camera provides a live video feed of the machine's cog mechanism on a 1960s Sony solid state television. The composite signal transmitted by the camera is picked up by the television's UHF receiver providing an unsteady ghost image of the original signal. Due to the imperfect connections and mismatched video formats the image

presented is unstable, and prone to interference. This interference is provided by the electric motor powering the machine, atmospherics (UHF is prone to interference from moisture in the air) and other approaching bodies. Indeed, the viewer will find that their presence significantly affects the clarity of the image. This is an encounter which serves as a reminder of the bodily intimacy of the machine-human relationship but more specifically that the video image is experienced *through* bodies.



Machine 28 (Self-regarding Machine),
installation shot for *Denis ex Machina*, 2016

Self-Regarding Machine presents one further video breakdown. The vertical hold of the television rarely remains constant causing the image to slide away at varying speed. This slipperiness of the video image causes a further encounter with the material of its production as the alien interaction of electrons, circuits and H₂O molecules emerge on the fluorescent inner surface of a cathode ray tube screen. The grainy and indistinct movement of the video image forms a picture that, as Thomas Levin and Jon Dovey in their work on surveillance cameras suggest, has become some sort of index of the real. (Levin, 2002: 578-593) (Dovey, 2000: 55-77). This quality of realness is a direct result of breakdown. As the video image breaks down in terms of its visual acuity it simultaneously engages the viewer with the material landscape beyond the visible.

2.24 Haptic Symptoms

a blow-out collapsed the front near-side tyre. The exploding air reflected from the concrete parapet seemed to detonate inside Robert Maitland's skull. During the few seconds before his crash he clutched at the whiplashing spokes of the steering wheel,

(Ballard, 2014: 7)

Ballard's *Concrete Island* (1974) begins with a breakdown, a blowout that leads to a serious car accident. This incident forms a part of Ballard's project investigating the violent sexual relationship between humans and machinery explored chiefly in *Crash* (1973). In *Concrete Island* the blowout forms the beginning of a process by which the protagonist is first connected anthropomorphically with the "collapsed face" (2014: 10) of his car and then with the island itself (2014: 131), a patch of land cut off by highways. This transformation is triggered by the haptic experience of breakdown. Haptic symptoms of breakdown experienced in my relationship with *Machine 16* follow a similar, if less violent pattern. While *Machine 16*'s pauses can be detected via a cessation of vibration through the desk at which I write, this haptic signal is overwhelmed by the aural and the visual. However, under the cover of these sensory impacts another subtler relationship emerges. My own pauses at the keyboard, sporadic cessations in the impacts between finger tips and sprung keys,

follow the attempts to articulate my thoughts. At this point, in reaching out to gently free the mechanism of *Machine 16* a parallelism is created between the human and the machine; a seize in the mechanism of mind and machine. That Ballard uses the haptic as the major connective force between humans and machines is not surprising as, in the car crash, it is these physical impacts that create the most catastrophic changes in the human body. Indeed chapter 19 of *Crash* describes a sexual encounter between two car crash survivors at The Earl's Court motor show. The connection between the lovers and the vehicles is articulated through the marks of their wounds and the chromium parts that caused them (Ballard, 2011: 144-149). This haptic scarring is central to the symphorophilic obsession of Ballard's characters. In the case of *Machine 16* and in the other machines engaged in this research, however, it is not in the moment of breakdown but in the experience of repair that the haptic connection is most keenly felt. It is in these moments when one releases a seize or reduces play by tightening a joint that the strain of the motor or off-kilter force of a cam can be apprehended haptically. There is a satisfying intimacy in this relationship in which an out of true part can be coaxed into place while the mechanism still runs, that a harsh vibration is felt through the fingertips and then smoothed by their touch.

2.25 The Breakdown of the Diagnostic Process

The symptoms discussed above are rarely experienced in isolation. Returning to *Machine 16* its camshaft is now moving spasmodically but no more than a millimetre in each direction. The motor is emitting a faint strained whine and a metallic burning smell can be detected. A mechanical engineer might take these symptoms and conclude that the machine has seized causing the motor to overheat. The cause of the seize might then be investigated and traced to excessive play in the cam which in turn has been brought about by wear at the junctions between motor spindle and cam and cam and camshaft. This wear in turn can be traced further to the weak interface between the materials used; mechanical overload due to the forces applied within the mechanism; poor manufacture and inevitably *Machine 16's* function as an alternatively-functioning artefact. In despair, the engineer might also conclude that it is not possible to describe this linkage of symptoms and failures as unidirectional or static as the process of breakdown continues to evolve. Each event of wear, seize or function causes further activity and further breakdown within

the machine. Deleuze and Guattari highlight this fluctuating multi-directional relationship in their discussion of Desiring Machines:

Every machine, in the first place, is related to a continual material flow (*hylé*) that it cuts into. It functions like a ham-slicing machine, removing portions from the associative flow ... (E)very machine is a machine of a machine. The machine produces an interruption of the flow only insofar as it is connected to another machine that supposedly produces this flow.

(Deleuze and Guattari 1984: 38-39)

In their description of machinic flow, Deleuze and Guattari already smear together the concepts of function and breakdown, of meat and metal, using imagery (later developed by Cronenberg) which confuses the idea of where one body begins and another ends.

When encountering breakdown in the machines of *Denis ex Machina* there is a similar lack of distinction between cause and symptom. This makes breakdown a slippery concept to get hold of. It also seems that the diagnostic process with its method of tracing various symptoms back to a root cause is itself breaking down. The breakdown of causality is also implied in Karen Barad's "performative account of material bodies" (Barad, 2007: 139) derived from her investigations into Bohr's theories of indeterminacy have revealed a schema which understands bodies being materialised anew from (cut)moment to (cut)moment. In setting out her theory of "Destructive Plasticity" Catherine Malabou also uses the word "cut" to describe the moment of accident in brain injury which separates the pre-accident individual from the post-accident individual (Malabou 2012: 29). Applying these patterns of thought to the interaction brought about by *Denis ex Machina* mechanical breakdown should be understood as a *juncture*³⁹ of machine and human bodies. Or rather that the idea of distinct human and machine bodies should be discarded in favour of recombining emergent assemblages of mechanical and biological parts. Further to this, Barad's and Malabou's use of the cut makes a significant move away from treating time as a

³⁹ Juncture rather than junction is used here because suggests temporal coming together which accounts for both Barad's performative account of material bodies and Deleuze's *Love* of material exchange and experimentation.

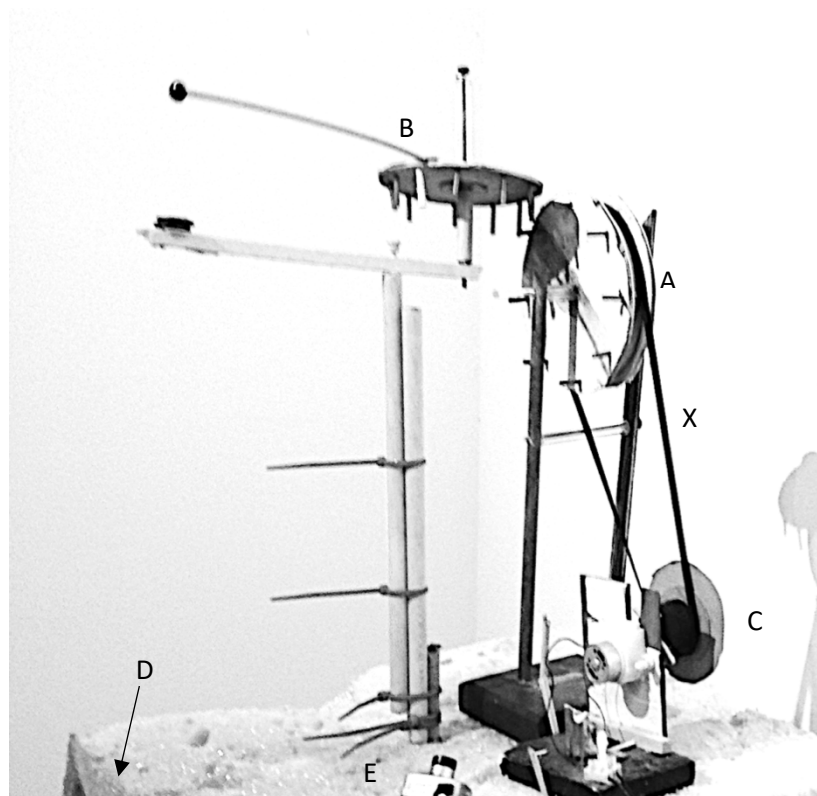
flow from past to future and present. Instead the cut suggests time is broken into pieces, a series of discrete and momentary phenomena. As one of these phenomena, mechanical breakdown articulates, and is articulated by, the machine-human assemblage moment to moment and notions of causality are irrelevant. Rather, each breakdown generates a temporal-material snapshot of the constantly changing linkages between bodies.

2.3 The Symptoms of Breakdown as experienced by the machine:

One of the aims of this research is to examine breakdown from the point of view of the machine. The intention is to come to a less anthropocentric understanding of how various forms of breakdown communicate. Given the thoroughly entangled view of breakdown described above and discussed in the work of writers such as Bruno Latour and Frank Trentmann (Trentmann, 2009: 297), for example, this might seem a difficult and perhaps irrelevant task. However, the observations of observations of the symptoms of breakdown by the machines of *Denis ex Machina* reveal a more material understanding of breakdown based upon signal and reaction.

Returning to the idea of *Self-regarding Machine* as an observer of its own breakdowns is an interesting exercise. One of the most common breakdowns expressed by this machine is disconnection caused by the drive belt slipping from the upper cam. At first sight this is a simple causal change in the machine's kinematic chain which can be summarised as follows:

Belt (X) slips from upper cam (A) leading to cessation of movement in upper cog and green rod (B). Lower cam (C) continues to turn. The pattern of shapes on screen (D) changes.



Machine 28 (Self-regarding Machine)

The machine observes this breakdown through a change in the mechanical relationships and forces that run through its body. As the belt slips off the upper cam it first rides up its retaining walls, increasing tension and pulling cams (A) and (C) closer together. This causes flex and movement in the cams' supporting structure, as well as strain in the motor turning cam (C). The motor emits heat and sound. Once the belt slips there is an instant relaxation of the tension and, depending on the position of the cog/rod assembly (B), it either ceases to move or swings in reverse by up to half a revolution before coming to a halt. At this point the lower cam (C) experiences less load and begins to turn more freely. That is until, or if, the belt becomes tangled in its mechanism. There is still considerable movement in the image on screen (D) caused by interference, and the partial failure of the television's vertical hold. However, the circular shapes cease to turn. Here the language of breakdown is expressed through changes of force in the kinematic chain. Each breakdown and subsequent repair alters this alignment subtly setting up a variable rhythm of breakdown and function (sometimes the machine will run for days uninterrupted at other times only a few minutes). In each cycle the root cause for

any breakdown shifts playfully around the components of the machine. This playful play is perhaps one of the machine's most important communicative aspects as forces ricochet through its linkages.

The second form of breakdown observed by *Self-regarding Machine* is one of interpretation.

Light is focussed on an array of pixel sensors behind the lens of CMOS camera (E). The camera encodes this as an AV signal which passes through a phono connector and TV aerial into a UHF receiver. These signals are translated into bursts of fire from electron guns onto the phosphorescent surface of the television's cathode ray tube.

There is in this process a constant movement between the digital and analogue, between particle and wave. The lossy image eventually created on screen with its components of: fuzziness, breaks and instability are only understood to be the result of a breakdown in signal by the human observer in that it is compared to an ideal original which is: sharp, clear, accurate, stable and fluid. The machine however, is merely performing a task of receiving and interpreting and passing on information. There is no sense in which *Self-regarding Machine* makes a judgement about the poverty of information it receives or the inadequacy of translation it performs. This sort of breakdown is, for the machine, hardly a breakdown at all. There is a disjunction here between the human view of breakdown and that of the machine. There is an assumption in Badiou's concept of *the event* (Badiou, 2007: xii), Baudrillard's *breach* (Baudrillard, 2004: 62) and Trentmann's *disruption*, (Shove, Trentmann, Wilk, 2009: 80), for example, that breakdown represents a shift from a Platonic ideal or norm, however, the machine's experience of breakdown challenges this.

2.4 A Non-Normative Understanding of Breakdown

As the previous section introduces, various forms of mechanical breakdown are usually characterised in terms of their difference to a perceived norm of smooth function. Whereas in the philosophical world this break from the norm is usually seen as being in some way revelatory (Virilio, Baudrillard, Badiou, Trentmann, Latour, et al.), in the quotidian world it is an event that requires: investigation, repair, prevention or insurance. Both views are essentially normative in their structure relying on a utopian or Platonic ideal⁴⁰ of seamlessness and human/machine synergy. However, the machines of *Breakdown* embrace alternative function in such a way as to reveal the possibility that this normative viewpoint might be inadequate. Both the philosophical and quotidian values, noted above, suggest an obsession with root cause, with a kernel of truth that is revealed in breakdown. Trentmann in using breakdown as a “temporary flashlight” (Shove, Trentmann, Wilk, 2009: 80) that makes actants suddenly visible is typical of this approach. Although Trentmann and others note the entangled relationships at work here, they fail to take the extra step suggested by my account of the playful nature of cause and effect in *Self-regarding Machine* and of Barad’s account of agential realism (Barad, 2003: 810). A step which applies a non-normative and non-causal to the understanding of breakdown. Adorno’s transformatory breakdown (2002: 275) appears to owe its root cause to the loosening of the gramophone’s spring. This is itself part of the normal function of a wound mechanism and a moment when the machine makes its presence felt on both the original work and the listener. The linkage Adorno describes (and is part of) here is one of melancholy and mechanics, darkness and decay. The moment’s *cause* doesn’t lie with the weakening spring, the gramophone’s transformation of topography into sound, the darkness in the room or the serotonin levels in Adorno’s brain. Instead, by removing the idea of cause, breakdown becomes a moment or juncture of alternative function with its own connective kinematic language.

⁴⁰ See Plato, Giovanni R. F Ferrari, and Tom Griffith. (2013) *The Republic*. 1st ed. Cambridge [u.a.]: Cambridge Univ. Press. 220-222.

2.5 Four Types of Mechanical Breakdown

Observations of *Machine 16* and *Self-regarding machine* have revealed many nuances of breakdown. This section will look more closely at a new typology of breakdown made up of four main tendencies.

2.51 Play

Hot dog, let's play games. You catch me and I catch you;
no love can cut our knife in two. For I'm a Little
Buttercup. Whoops!

(Asimov, 1950: 42)

Psychologist and Vice President for Interpretation at the *Strong National Museum of Play* Scott Eberle's article in the *American Journal of Play* (Eberle, 2014: 214-233) seeks to find a definition and philosophy of play. He draws together research from Neurology, Ethology, Psychology and Education theory to come to a definition of play as an emergent process combining six elements: Pleasure, Surprise, Anticipation, Understanding, Strength and Poise. Perhaps unsurprisingly he does not discuss the mechanical notion of play. This is also true of dictionary definitions which encompass a wide range of meaning including: the non-serious, the imaginative, the insubstantial light and quick. Play for machines refers to latitude, range or freedom of movement and specifically movement out of true, that is away from the intended direction. Mechanical play can be beneficial. In allowing parts some flexibility in transmitting forces through the kinematic chain play can avoid the risk of the machine seizing. Already play has a dual nature.

Play as breakdown, or as a symptom of breakdown, is usually part of a language of excess and transgression. *Too much* play in a system can lead to forces being directed increasingly erratically and in new, unwanted, directions. These forces can lead to changes within the structure of the machine such as breaks, deformation, wear and further play. As Eberle suggests, even in a machine, play is an emergent and connective language (Eberle, 2014: 220). *Machine 16* is still functioning, though functioning differently, as I type. Louder key strikes continue to activate its sensor providing a developing example of play in action. As noted above, play in the

cam and revolute joints of *Machine 16*, not only play a part in creating the spasmodic and free movement of its fluttering fan struts but they also play a role in evolving and restructuring the machine itself (here play is a sort of insubstantial actant). Play exists throughout the linkages that make up *Machine 16* introducing forces within the machine that flow at angles and with varying intensities as they coincide with, and counter, each other. In the last hour, these forces have altered the structure of the machine by loosening the housing that holds the motor in place. This has introduced further play into the system as the housing sends new signals of force back into the linkage. This emergent system of feedback and change lends the machine a sort of mechanical proprioception.

Striking the spacebar harder, for fun, I become part of the system.

Eberle, following Hendricks, notes that play involves both rule making and rule breaking (Eberle, 2014: 216). This transgressive role is central to the vocabulary of play. Play as a way of transgressing rules, of breaking free from constraint is a central theme in the work of Jean Tinguely. In associating his mechanical works with notions of liberty and expressions of emotion, commentators such as Meyer (Meyer, 1960: 97) and Allington (Satz, A. Wood, J. ed, 2009: 148) are essentially responding to play. It is play that causes the squeaks, erratic movements and variations in repetition that make up what Tinguely terms “anti-” or “happy machines” (Pathé, 1959)

Asimov picks up the theme of the transgressive nature of play in his second short story in the *I Robot* compilation. In “Runaround” a robot is seen to play at a moment of breakdown engaging in a game of chase with its human masters. This breakdown is, as usual, caused by a conflict in its governing laws which cause it to become “drunk” (Asimov, 1950: 42). This conflict is itself brought about by a certain amount of play within the structure of the three laws as, like elements in a machine, they work with and against each other. In the case of “Runaround” the play is due to fluctuating levels of danger caused by the environment and the robot’s orders (Asimov, 1950: 44). Here play is caused by a build-up of conflicting pressures within a system. The robot’s playful language, quoted at the beginning of this section, reveals that in play it is breaking the rule that a machine should *behave* in

terms of its function. But also its nonsense rhyme, by reversing the subject and object in “no love can cut our knife in two” plays with causality and mixes emotional and material objects. In both the mechanical system of *Machine 16* and the fictional system set up by Asimov the feedback loops of a playful system can be seen to break down barriers of causality and form, creating new connections.

2.52 The Seize

In a machine, a seize is a form of stoppage due to its parts jamming. The symptoms can include: sound, heat, smell, sluggish or sporadic movement or complete cessation. These symptoms occur when the forces in the machine, rather than being transferred by linkage from power source to output are turned in on themselves. The causes of machine seize can often be traced to a misalignment of parts due to wear or deformation. This misalignment is usually caused by friction, heat and lack of lubrication which are, in turn, often the results of the machine’s normal function. A seize is a very different form of breakdown to play as, rather than spreading its communication through a system, it draws focus in.

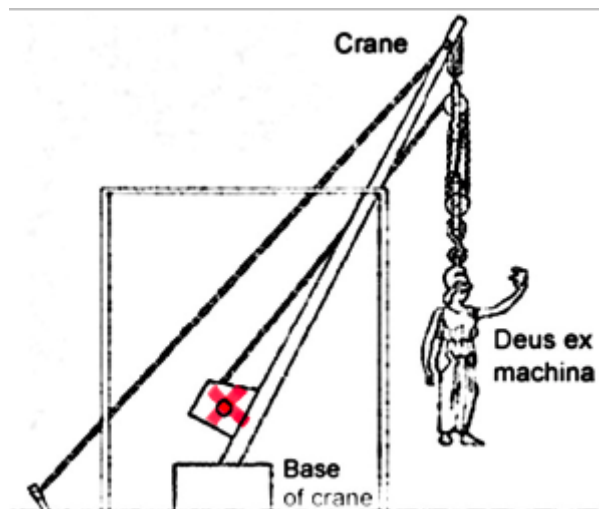


Blondin's Apparatus, 2016

Blondin's Apparatus, 2016 is a film made from documentary footage of an installation which explored the experience of high wire walking. The installation contained two machines. One, made from Meccano and broken furniture, tracked a video projection of a tightrope walker along the gallery wall. A second machine presented a live image of a piece of thread stretching into the distance and swaying gently in response to movement in the gallery space. Both machines presented an

illusory narrative of the tightrope walker crossing and re-crossing the gallery space. It was, however, a fragile illusion. The installation presented a mundane peril as the momentary jumps and seizes in the mechanism threatened to stop the machines and bring their illusions to a halt. The peril was not that the walker would fall but that the machine would fail. Each seize drew the viewer's attention away from the narrative of the illusion to the kinematic flow of the machine.

The risky theatrical illusion of *Blondin's Apparatus* introduces a thought experiment involving the mechane of Ancient Greek Theatre (see [Glossary](#) p.180). This machine formed a part of the theatrical apparatus The *Deus ex Machina*⁴¹, first used by Aeschylus and Euripides (Rehm, 1992: 68-73) to fly a god onto stage. (Rehm, 1992: 70). Deployed to dig the story out of a plot hole, The *Deus ex Machina* made a conscious break in the narrative and, to create a god, a theatrical cyborg was enacted. But what happens if the mechane seizes in the base of its mechanism? (see the red x in the illustration below) – What happens to the Deus ex Machina machine-human-god-becoming then?



The actor is left swinging in space. He stops his soliloquy and cries out. No doubt, as the actor is playing a god, he is in the process of imparting some vital information to the hero of the play. The audience exclaims and falls silent, the rope

⁴¹ Chondros, Thomas G.; Milidonis, Kypros; Vitzilaios, George; Vaitsis, John (September 2013). ""Deus-Ex-Machina" reconstruction in the Athens theater of Dionysus". *Mechanism and Machine Theory* 67: 172–191. This article describes a reconstruction of a Deus Ex Machina from archaeological and literary evidence.

creaks and new sounds of activity emerge from backstage as the stage crew try to free the mechanism. The play stops, the actor stops, the god disappears.

There is certainly stoppage here, but more than this there is a change. The components of the machine-human-god-becoming are the same, but their relationship has been altered by the seize. A new body is formed. This reconfigured body causes stresses for the audience, the theatre company, the narrative. There is a breakdown of the anthropomorphic image. The god-human-machine becomes an imperilled actor, a jammed machine and a ruined play. The machine's own inertia and creaks become part of the experience of the change in status of the machine-human-god. In this way, the language of the play (the linguistic turn) is displaced by a language of mechanical force.

Machine 16 also seizes on occasion. Its stoppages are less dramatic than the scene described above and usually take the form of a slowed sporadic action accompanied by a rising whine from its electric motor. At most it requires a gentle nudge to free it from its sluggishness. This nudge is part of the convergent impulse of the seize drawing in from beyond the machine. *Machine 16's* seizes also reveal something of the temporal nature of this breakdown which is again subtly different from that of play. In its judders, and slow-moving action there is a reminder of what should come next but doesn't. Just as when a film projector seizes and burns through the stilled frame the viewer is left with the ghost of expectation, it is a little death. As Elizabeth Locey (drawing on Barthes) notes in her work on Violette Leduc:

Bliss, or *jouissance*- "la petite mort"- is precisely that place where the subject loses him/herself, where language breaks down: *jouissance* cannot be spoken.

(Locey, 2002: 21)

In the *Bastille Interviews*, 1993 Rebecca Horn repeatedly returns to a similar concept in her use of the word "faint" to describe the breakdown of her mechanical sculptures. This form of human stoppage may have special resonance for her given her history of respiratory illness but it is also used by Horn to describe a moment when her machines move away from the mundane.

They react as we react. My machines are not washing machines or cars. They have a human quality and must change. They get nervous and must stop sometimes. If a machine stops it doesn't mean it is broken. It's just tired. I don't want them to run forever. It's part of their life that they stop and faint.

(Guggenheim Museum, 1993: 27)

Fainting or Syncope, meaning a thorough cutting off, is caused by a lack of oxygen getting to the brain and a miscommunication between brain and the autonomic nervous system (Payne, 2018). Fainting can be caused by a range of physical and emotional responses including stress and overcrowding and could be considered one of the human equivalents to the seizure. Indeed, it has strong similarities to the fictional robotic faint, the short circuit. This is a form of stoppage that is referred to in “Liar” (Asimov, 1950: 92-109) in which a positronic seizure is induced when a robot is confronted with an insoluble clash in its programming. The same event, and possibly the first robot faint in film, is played out in *Forbidden Planet*, 1956. When Robbie, named after Asimov’s first robot, is ordered to shoot a human the robot’s internal conflicts are made visible through a sudden immobility and an electrical light-show in his glass domed brain. In all these cases the seizing machine has moved beyond the language of its programming to a concentrating form of stoppage, a material event which interrupts: illusion, narrative, time and language.

2.53 Burnout

Burnout or the failure of an electrical device through overheating is less common in the machines forming this research. Burnout tends to occur more during the manufacture process. This is because of the experimental approach used whereby motors and other electrical components are connected in various ways and put under electrical strain to see what will occur. At such times a tell-tale burning smell may signal that a device has been wrongly connected or subject to too much charge. At other times burnout may occur due to a seizure. An electrical motor works by transforming electrical energy into kinetic energy, if it is stopped from turning the energy will be dissipated as heat. This heat, in extreme cases will burn away the

protective lacquer of the windings resulting in failure, and possibly fire. Burnout will also occur in some electrical motors through the insulating lacquer breaking down over time due to dirt and moisture. In all cases burnout is a form of breakdown that requires replacement of the affected part.

The AAIB said the 66 messages and alarms in the final three-and-a-half minutes of the flight may have created "audio overload" and "mental stressors".

(BBC News, 2016)

In 2016, the Air Accidents Investigation Branch concluded that a pilot had been suffering from “mental overload” (BBC, 2016) when he overshot the runway at Blackbushe Airport crashing into a car auction site. Words such as *overload* and *burnout* have become common mechanomorphic descriptors for the psychological pressures humans face in the workplace. *Burnout Syndrome* was first coined by social psychologist Christina Maslach in 1981 (Weber, Jaekel-Reinhard, 2000: 512). In creating a diagnostic instrument, the *Maslach Burnout Inventory* (1996) Maslach sought to come to a definition and diagnosis of mental collapse due to work-based strain. Further research by Weber and Jaekel-Reinhard came up with a description of *Burnout* as a dynamic process ranging from hyperactivity to despair which flows much like the behaviour of a motor undergoing a sudden rise in current (Weber, Jaekel-Reinhard, 2000: 514). Ethnographers Ehn and Löfgren’s essay “Routines – Made and Unmade” (Shove, Trentmann, Wilk, 2009: 99-112) also discusses burnout syndrome in mechanomorphic terms. Ehn and Löfgren frequently use the image of the autopilot to discuss the way in which we deal with the myriad unseen routines of existence and the disaster of what happens when it ceases to function. It is friction and overload, they say, that leads to the crash. In these descriptions and the news story above, the central theme of burnout seems to be a catastrophic move from excess to nihilism. Unlike both play and the seizure, burnout is not creative of further movement nor can it be momentary in nature. Its vocabulary is one of frenzy, heat, stillness, blackness and smoke.

2.54 Cutting Loose

Been working so hard
 I'm punching my card
 Eight hours for what?
 Oh, tell me what I got
 I've got this feeling
 That time's just holding me down
 I'll hit the ceiling
 Or else I'll tear up this town
 Now I gotta cut loose
 Footloose, kick off the Sunday shoes
 Please, Louise, pull me off of my knees
 Jack, get back, come on before we crack
 Lose your blues, everybody cut footloose

(Loggins, 1984)

Kenny Loggins' lyric characterises *cutting loose* as a venting of pressure of the working classes. In the context of the film for which it was the theme song *Footloose* (1984) cutting loose represented the freeing of repressed teenage expression. However, cutting loose here was not a call to destroy the system, to break the machine, rather it represented a letting-off of steam that would allow the smooth running of society to continue. This is an exploration of an idea posited by Fritz Lang in *Metropolis* (1927). In an iconic image, Lang shows a worker struggling to keep time with the factory machine by moving the hands of a giant ten-hour clock. When the worker fails, or leaves his post, disaster ensues. The motifs of clocking in and out in both song and film are suggestive of the worker trapped in machinic time. As Alan Williams points out in his essay "Structures of Narrativity in Fritz Lang's *Metropolis*":



Metropolis, 1927

Time is the measure of the repetitive effort
 required of the proletariat.
 (Minden and Bachmann, 2002: 168)

In tackling this view of work as confinement, both Loggin's and Lang's work clearly have revolutionary implications. For both, *cutting loose* from the machine

suggests a freeing of emotion and a move to violence. This notion is also picked up in Karel Capek's play *Rossum's Universal Robots* (RUR), 1920 in which the robot workers break free from their programming and violently revolt against humanity. Their release from control and attainment of free will follows a violent physical fit (Capek, 2013: 29, 39). In "On Some Motifs in Baudelaire" (1939) Walter Benjamin, quoting Marx, notes the deep connection between the factory worker and the machine.

In working with machines, workers learn to co-ordinate
"their own movement with the uniformly constant
movements of an automaton".

(Benjamin et al., 2013 :175)

This closeness goes beyond mimicry to a physical harmonising of flesh and metal. In this context, the sudden power of cutting-loose is most keenly felt. *Cutting loose* is a moment of extreme danger and extreme freedom. For the worker, the possibility of becoming footloose is barely separated from the possibility of becoming limbless.

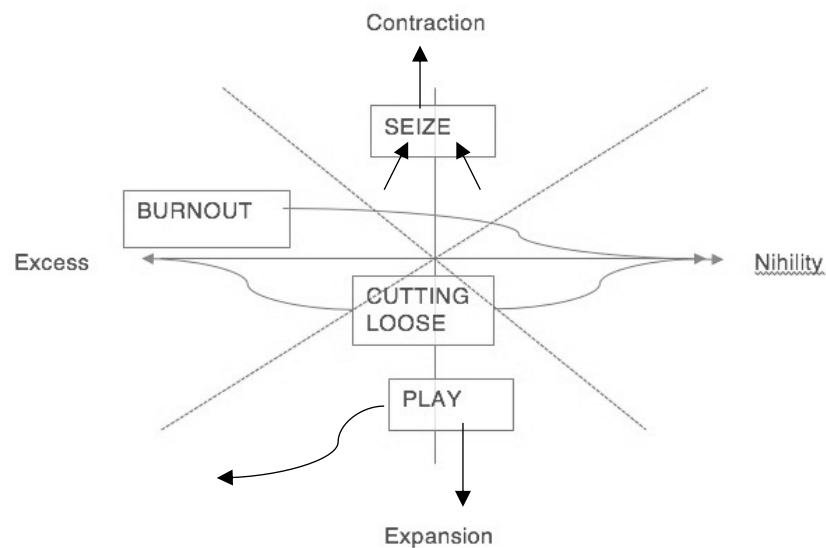
Machine 16 has finally cut loose. Its camshaft has become disconnected and now the cam, freed from its work, spins wildly in frenzied revolution. A part, probably a nut, has been flung away by the increased speed of the cam, it has escaped. While one part spins the rest of the machine is still, like a wallflower at a teen disco.

Disconnection within a mechanical linkage has some connections with the fictional cutting loose described above. Power, rather than being transferred through the machine's linkage, is diverted. In the case of *Machine 16* because of the cam's disconnection it has less work to do and, although its centripetal force remains the same, the reduction of friction within the system allows it to spin at a faster rate. From, an anthropocentric standpoint this work is now wasted and, given the speed of revolution, relatively dangerous. The creation, here, of a new kinematic chain has left the remainder of the machine at rest. Returning to Malabou's notion of destructive plasticity (a plasticity that is not plastic), *Machine 16* has become a new individual.

2.6.1 Conclusion

Each of the symptoms as apprehended by the human above develop a connection with the machine— demand and connection, drawing in, intimacy and adventurous *Love*. Anti-causal and anti-normative approaches undermine the diagnostic process usually applied to breakdown allowing a new understanding based upon the momentary remaking of linkages. Common to the typology of breakdown discussed in this chapter is the idea that the forms of breakdown occur at junctions: junctions between parts, junctions between materials and junctions between electrical signals and mechanical forces. However, despite this, they are difficult to pin down; momentary junctures. The juncture⁴² which is defined as a point of time made critical by circumstance is also a term from linguistics used to denote the manner of moving between two consecutive sounds. Different types of juncture can change the meanings of sequences of sound (Nicolosi, Harryman, and Kresheck, 2003: 166). This definition allows a fluid description of the slippery temporal and spatial location for the breakdown. In *play*, *seize*, *burnout* and *cutting loose* this chapter has presented four new typologies for breakdown which, although related and intra-acting, act in distinct ways both within the machine itself and in the machine's connections to other bodies. Furthermore, it is possible to identify in these breakdowns tendencies of expansion (*play*), contraction (*seize*), excess and nihility (*burnout & cutting loose*). However, these tendencies are apprehended by both the human observer and the machine as unstable and relational rather than fixed and absolute.

⁴² See Glossary p. 178



The diagram above, which to some extent apes those used to explain aspects of quantum physics, attempts to present this new typology of breakdown as relational phenomena brought about by intra-action of apparatuses of observation (human and machine) and which simultaneously enact the apparatuses themselves⁴³. These phenomena are seen to slip between the axes of Excess & Nihilility and Contraction & Expansion inhabiting more than one location at any juncture.

Taking the quantum analogy further, Barad's explanation of Niels Bohr's concept of indeterminacy gives a framework for further understanding the slippery nature of breakdown.

A condition for objective knowledge is that the referent is a phenomenon (and not an observation-independent object).

(Barad, 2007: 198)

In using Barad's relational ontology and referring to breakdown in terms of a network of *things-in-phenomena* (Barad, 2007: 817) it is possible to see breakdown as inseparable from the human as well as creative of the human (as well as being inseparable from the machine and creative of the machine). This convoluted linkage

⁴³ For further discussion of apparatuses as phenomena see Barad, 2007: 146.

leads to an understanding of how breakdown is such an affective and *anthropomorphis(ing)ed* force and will be discussed in the next chapter.

Returning finally to Adorno's darkened room, the slowing gramophone and the juncture of a breakdown that isn't really a breakdown. Adorno's description makes one aware of these junctures of material and time:

needle
 spring
 groove
 vinylcochlea brain speaker planetaryrotation

3. THE HUMAN MACHINE

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 - 3.11 The Wonder Turner
 - 3.12 *Sequence 1* - Breakdown
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 - 3.14 *Sequence 2* – Breakdown
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 - 3.31 Humans and Machines – *Machine 19* and the Selfie
 - 3.32 The Meat Machine – Repairing *Love Machines*, Minsky & Asimov
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3 The Human Machine

After a series of self-generated disasters, Basil Fawlty is racing to deliver a takeaway gourmet meal to his Torquay hotel. Inevitably the Austin 1100 Countryman he is driving breaks down. His subsequent screams of “YOU VICIOUS BASTARD” and “RIGHT, I’M WARNING YOU” are answered by the rapid stutter of the car’s starter motor. The pitch of Basil’s impotence and the motor’s failure rise in a harmony of pain until he leaps from the car and proceeds to thrash it with a branch. (Fawlty Towers, 1975)

In terms of classical ascriptive anthropomorphism and mechanomorphism, the relationships set up in this comedic passage are clear. In breakdown, Fawlty ascribes the machine with the anthropomorphic quality of vindictiveness and proceeds to punish it in a futile response. Concurrently the audience is made aware of one of the running jokes in Connie Booth’s and John Cleese’s writing, the faultiness of Fawlty himself. Cleese’s characterisation of Fawlty further adds to his mechanomorphic name. Fawlty is simultaneously highly human: emotional, angry and deceitful while Cleese’s physical portrayal is full of the jerky movements, wild repetitions and temporary seizures associated with the machine in breakdown. Henri Bergson had already noted a parallel between the human and machine in his work on laughter in 1911.

The attitudes, gestures and movements of the human body are laughable in exact proportion as that body reminds us of a mere machine.

(2005: 15)

Here he sets out a clear hierarchy in the mimetic process. Mechanomorphism, for Bergson, is a process that highlights the difference and superiority of the human over the machine, anthropomorphism is therefore a process of delineation and control. Fawlty’s act of incoherent violence against the car also serves to isolate one of the chief oppositions to anthropomorphism from many New Materialist writers. Quentin Meillassoux typifies this standpoint, in his refusal to transpose human subjectivism onto non-human bodies. He states he:

is opposed to any anthropomorphism which seeks to extend subjective attributes to Being: materialism is not a form of animism, spiritualism, vitalism, etcetera. It asserts that non-thinking actually precedes, or at least may in right precede thought, and exists outside of it...

(Dolphijn, R. & Van der Tuin, I. 2013: 79)

However, as this research has revealed, the binaries of human and machine are impossible to maintain. Rather they are spatio-temporal junctures brought into a variety of temporary foci by forms of breakdown. This position calls for a re-evaluation of what anthropomorphism is and how it functions with breakdown. In the passage above, there is little doubt that Fawltly is also breaking down and that he and car are one. Furthermore, the symptoms of breakdown, the stutter of the motor and the pitch of Fawltly's voice are part of a series of events whose ripples temporarily materialise the body - Fawltly/Machine. In this case, the anthropomorphic and mechanomorphic signals experienced are a recognition of a paramorphic⁴⁴ linkage in action.

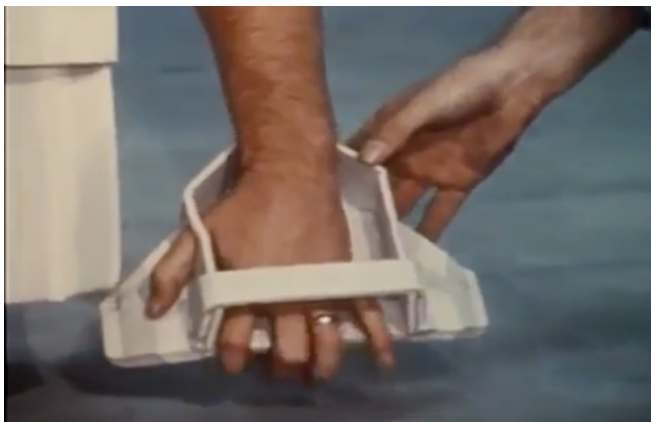
This chapter will employ the idea of breakdowns bringing bodies into temporary focus and apply it to several cases of machine-human interaction that display anthropomorphic or mechanomorphic symptoms. Like the crash-landing plane described in the methodology it will bounce three times before coming to a rest. 3.1 The Robot- A Technical Dilemma will unpack the role of breakdown in reforming the anthropomorphic linkage. It will look at the robot in science fiction filmmaking and the "Making of" film via an abortive performance piece *AI* (2016), a thaumatropic film, *Thaumatrope* (2011)⁴⁵ and an examination of human-machine breakdown in *Silent Running* (1972). 3.2 Cyborgs of Transcendence will return to my film *Deus* (2017) and the first Niagara Falls barrel rider Annie Edson-Taylor to explore machine-human embodiments and the effects of breakdown on the

⁴⁴ Paramorphism is a term borrowed from minerology whereby a chemical compound changes in crystal structure but not in chemical composition. As such it describes a process by which a body can transform through rearrangement of its component parts and their connections. Paramorphism is discussed in more detail in the Glossary.

⁴⁵ The Thaumatrope, literally *wonder turner*, is a 19th Century optical toy. It consists of a card disc with different images on each side. When the disc is spun on its axis the images are combined to form one, a reminder of the material nature of vision. The most common thaumatropic iteration is a bird and a cage, a play on the binaries of nature and culture.

Vitruvian model. 3.3 The Mechanomorphic Human flips the viewpoint to look at mechanomorphism as a connective rather than ascriptive process. It will examine the relationship between *Machine 19*, an anonymous visitor, and Marvin Minsky's concept of the brain as a meat machine. 3.4 Paramorphism - boundaries revisited takes a paradoxical flight of fancy to look at paramorphism as a model for understanding how gestures of function and breakdown become the motive force in the dispersal and formation of new bodies.

3.1 The Robot – A Technical Dilemma



The Making of Silent Running, 1974

In *The Making of Silent Running* (1974), a significant amount of time is dedicated to the construction of the maintenance robots (Drones) and their operators, four bilateral amputees chosen to ensure the robots would not appear to be costumed actors⁴⁶. This placing of the material constraints of the robot bodies ahead of the human body highlights a breakdown in the usual linear causal relationship between actor, costume and character. Instead we are presented with a decentralised linkage in which all parts act on each other, each Drone becoming a dispersed ensemble of component parts: vacuum formed casing, truncated human actor, radio controlled robotic arm, external radio operator, external manual puppeteer and the lead actor Lowell played by Bruce Dern⁴⁷. This ensemble extends further to include the decommissioned aircraft carrier used as a set for the spaceship *Valley Forge* whose bulkheads interfered with the radio signals used to control the robotic arms and

⁴⁶ Larry Whisenhunt, Steve Brown, Mark Persons and Cheryl Sparks.

⁴⁷ It was asserted by the director Doug Trumbull that the Drones had no “personality” beyond what was projected onto them by the traumatised mind of lead character Lowell, played by Bruce Dern. (Kermode, 2014: 52-53).

cramped spaces forced the camera operators to use a series of uncomfortable angles and tightly cropped shots⁴⁸.

In this example and those that followed such as *Star Wars* (1977) and Disney's *The Black Hole* (1979) film publicity and "making of" documentaries have caused slippage between the diegetic and extradiegetic elements in the construction of a robot. Since *Silent Running*, and until recent developments in CGI, it has been impossible to separate a small robot from its genetically (in the case of R2D2 or Twiki⁴⁹) or physically "other" operator. Indeed, a normative understanding of the "damaged" ensemble of amputee/robot has become central to their anthropomorphic force. In 1971 Esquire published an article on the creation of the Drones entitled "A technical dilemma". The article highlighted the machine-human relationship in focusing on the technical issues and describing the genesis of the robot drones as a:

a machine-replaces-man-replaces-machine trick
(Kane, 1971)

This *trick*, the constant flickering shift between human and machine was explored in detail in the work *AI* made at FACT in 2016. *AI*, took the form of a series of documents of an art performance that never occurred. The putative event involved the making of a robot costume to be deployed in FACT and self-operated. Rather than going forward with the performance, however, the work was documented through production stills, design drawings and an informal article "What is it Like to be a Robot?" published on the [FACT blog](#). The work's title *AI*, was also deliberately misleading being the first two letters of my name rather than referring to artificial intelligence. The title also recalled the anthropomorphic, acronymic nomenclature of

⁴⁸ As Mark Kermode notes in his discussion of the film, this ensemble continued to expand throughout its making. Anxiety over the employment of amputees made connections with uncomfortable and violent fusions between human and machine and wider political anxieties surrounding the Vietnam War. Although none of the Drone actors were war veterans, several ex-military personnel, victims of land-mines, also helped with the design and construction of the drones (Kermode, 2014: 48-50).

⁴⁹ Twiki was a diminutive and barely verbal robot in the 1979 television series *Buck Rogers in the 25th Century*. Felix Stilla and Patty Maloney (actors with Dwarfism) physically performed the robot while Mel Blanc and Bob Elyea performed the voice. Twiki's main role was to carry an artificial intelligence Dr Theopolis and to make one word acerbic comments. (*Buck Rogers in the 25th Century*, 1980)

many fictional robots: WALL-E, HAL, V.I.N.CENT⁵⁰. As such *AI*, as a title, is truncated and as an artwork it is a “making of” document without a product. This separation of work from production is symptomatic of a breakdown, a seize interrupting illusion. Here in *AI*, the “making of” form acts in the same way, it draws focus on the material qualities of machine-human interfaces in the creation of a fictional robot.

I am very aware of my breathing inside the head, it interferes with the muffled vibrations I receive as sounds contact the outer shell. I only have one visual sensor. This monocular vision is projected directly onto my retina via a low resolution digital camera. Unable to cope with anything but the slowest movement, the image jumps and blurs. A single plastic pincer enters my visual field and attempts to pick up a pencil. I control it, but it feels as if someone else does. Depth perception is not good and several attempts are needed before the pencil is slowly and deliberately held and rotated into position. I begin to write my name. The pencil slips.



(Pearl, 2016)

This passage from “What is it Like to be a Robot?” highlights the criticality of sensory interface breakdowns in the enactment of a fictional robot. The robotic experience presents a double proposition in terms of interruption and loss coupled with a heightened awareness of physical inputs: aural, visual and haptic⁵¹. It is a technical dilemma.

⁵⁰ From the films: *WALL-E*, 2008, *2001: A Space Odyssey*, 1968 and *The Black Hole*, 1979, this anthropomorphising tendency is common in the naming of fictional and non-fictional AIs and robots. IBM’s question answering system Watson is a recent real-world example of successful anthropomorphic naming-as-control for an artificial intelligence.

⁵¹ A similar experiment was made by artist Anna Dumitriu in her performance *The Emergence of Consciousness*, 2010. In this piece Dumitriu set herself in competition with a machine by limiting her senses to match a simple robot and racing it to find the centre of a room. Although, as the title suggests, this piece explored the nature of the consciousness of a robot. Dumitriu’s blundering

The technical dilemma is further explored in *The Making of Silent Running*. Cheryl Sparks/Huey/Drone 2 is briefly interviewed about her experience as a Drone actor.

Narr: Is there a special feeling that you have towards people once you're inside that outfit – you start taking on a feeling of a robot.

Cheryl Sparks: You do kinda, yeah especially the scene when the dome is about to blow-up It's like, I was really there and in a few seconds everything was really going to blow up.

(*The Making of Silent Running*, 2002)

In her second response, Sparks, aware she is being led, gives a qualified answer and an example which describes entering the narrative of the film rather than the mind of a robot. Her first answer, deals exclusively with haptic feedback. She describes the physical push-pull of enclosed comfort and restricted movement and, although not what the interviewer wanted, this haptic exchange is more important for an understanding of machine-human relationships. This idea is further developed in conversations with other robot/human actors. When interviewed, they often talk about their experience in terms of the way in which their interactions with the world, and each other, are reconfigured by the physical limitations of their robot bodies.

You can imagine what it felt, and sounded like, for me. It was just like being inside a Rubik's cube with people on the outside arguing over the instructions.

(Blitz, 2013)

Here *Star Wars* droid C3PO/Anthony Daniels concentrates on feelings of isolation, truncated sensory information and the feeling of being transformed into a technical object.

The concept of telepistemology as discussed in Ken Goldberg's *The Robot in the Garden* (2001) is important here. The examples examined in Goldberg's book deal with the apprehension of directly unverifiable, mechanically mediated, information

actions focussed entirely on limitation both in her own ability to cope with the parameters of the experiment and in the machine's truncated inputs. In opting for a fictive rather than scientific methodology *AI* reveals the possibilities for understanding the richness of the material experience of the machine.

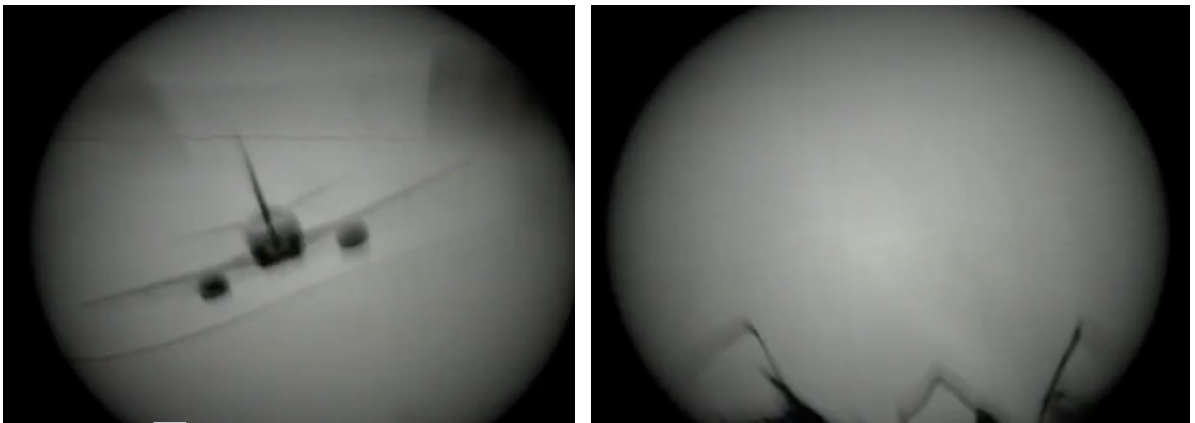
gathered over distances of metres or even miles. However, distance is not a factor in this case. As Anthony Daniels states above, the same anxiety of unknowing, expressed by Dreyfuss in his essay “Telepistemology: Descartes’ Last Stand” (Goldberg ed., 2001: 51-7) is as active over a matter of inches as it is across continents. Indeed, the example used by Dreyfuss of Descartes sleeping in an oven, bears striking resemblance to the experience of the drone/actors in *Silent Running*. However, instead of developing a dualistic notion of mind and body, their responses to encasement are more direct and haptic. The drones/actors, both isolated and connected, developed new relationships with their environment and a language of “clattering gestures” (Kermode, 2014: 54). The act of dressing up as a machine here and in *AI* deals primarily with ways in which the body interacts with what is considered the outside world. There is a suggestion in the drone actors’ responses, and in my own text for *AI*, that mechanical elements act as interfaces simultaneously connecting, restricting and signalling their presence. The Drones’ new language of “clattering gestures” along with Sparks’ description of her robot body bringing her into the world of the film suggest that the machine/human experience here extends Merleau-Ponty’s concept of being in the world to include the machine. However, in stating that the body materialises “between the see-er and the visible, between touching and touched” (Johnson ed., 1993: 126) Merleau-Ponty describes the body as a single bounded entity albeit brought about by its connections. Experiencing the Drones and *AI* through the ideas of shifting relationships described in the previous chapters suggests a different approach, one which refigures the body from bounded to boundless, a body that glimmers and connects. There is no doubt that the Drones and my fictive robot *AI*, especially when experienced through the “Making of” form, are flickering entities. They are at once: human, fictional, mechanical and material in nature, isolated and connected. Taking Haraway’s pivotal statement asserting humanity’s full entanglement with the mechanical⁵² I would like to rephrase it:

The machine is us, our processes, an aspect of our disembodiment.

⁵² The machine is us, our processes, an aspect of our embodiment. (Haraway, 1991: 180)

3.11 The Wonder Turner

To develop the idea of the flickering human/mechanical body further the following sections will make a thaumatropic examination of two sequences from *Silent Running* that deal with a series of events moving from a violent incident leading to breakdown and repair. Both sequences are central to the sentimental anthropomorphising project of the film as they depict events which radiate from Lowell/Dern's actions. In doing so they present the Drones as passive receivers of the anthropomorphic force of Lowell/Dern⁵³. However, rather than examine the sequences in this narrative, causal and anthropocentric order, the following sections will assess *Silent Running* and *The Making of Silent Running* in parallel taking the diegetic and extradiegetic⁵⁴ breakdowns and their symptoms as flickering events that bring bodies into temporary focus.



Thaumatrope, 2011

A thaumatrope is a machine that seeks to reveal its workings. Only at a rarely achieved optimum speed of spin is its illusion maintained⁵⁵. More often it is approaching or moving away from this acme and in doing so the relationship between material and illusion is constantly shifting. In the case of my film *Thaumatrope* (2011), illustrated here, a low flying aeroplane and mountains are brought together in a reference to the early aviator Antoine de St-Exupéry. As the

⁵³ As Director Doug Trumbull says: "For me, the story was always about *him*; it's not about them, it's about the way he projects *onto* them." (Kermode, 2014: 52)

⁵⁴ Here, the extradiegetic breakdowns are taken to be those that are described in *The Making of Silent Running*, and that had significant impact on the production of each sequence.

⁵⁵ Once believed to be created by an illusion called persistence of vision, this optimum speed relates to motion perception by two or more photoreceptors in the eye. A detailed understanding of the developments in this field can be found in Borst, Alexander; Thomas Euler (2011). "Seeing Things in Motion: Models, Circuits, and Mechanisms". *Neuron*. **71.6**: 974–994

spin slows it generates an increased awareness of all three images (aeroplane, mountains and aeroplane/mountains) simultaneously. In fact, attempts to collect a suitable screenshot for this research revealed that the combined image of aeroplane and mountains does not exist in the video at all. It only appears through the film's connection with an observer. Furthermore, as this simple device slows, the video also reveals the edges of the machine, its mechanics of card and string. This process of intra-action drawn from Barad's "performative account of material bodies" (Barad, 2007: 139) emphasises the role of connection not only in the materialisation of material bodies but also illusory ones.

3.12 Sequence I - Breakdown

Lowell's knee is damaged. Symptoms include: stiffness, blood loss, sweat, shaking, heavy breathing, fainting, strained voice and weakness. In mechanical terms Lowell is experiencing a seize in the knee spreading to other systems of the body and drawing in focus. This seize is not limited to Lowell's body, it is a breakdown that forms a fulcrum around which the whole film turns. From this point one can trace a series of presequences and consequences, back in time towards Lowell's decision to kill fellow crew members and rescue the forests held in the Valley Forge and, forward in time, to his decision to commit suicide. This seize is also the force that draws the Drones and Lowell together. It begins their anthropomorphic shift from incidental devices to central characters. Following surgery, Lowell's increased need causes him to give the Drones autonomy, it is at this moment, and the only time in the film (for humans or machines) when a first-person shot is used, the view from inside the machine.



Silent Running, 1972

3.13 *Sequence 1 – Repair*

The repair of Lowell's leg reveals various diegetic and extradiegetic breakdowns which lead to a constant switching between human and machine. Before the operation can begin the Drones must be reprogrammed. This is a visceral process in which Lowell severs and reconnects circuits using a laser while the camera cuts between: sparks, smoke, the sweat on Lowell's face and a sudden halt in the Drones' movement. The cut is important here not only in cinematic terms but also in relation



The Making of Silent Running, 1974

to my interpretation of Malabou's and Barad's use of the term discussed in [Chapter 2](#). Taking breakdown as generating temporal-material snapshots of the constantly changing linkages between bodies reveals this rapid cutting as a flickering thaumatropic event producing human and machine simultaneously. This cutting is continued beyond the scene's narrative. Filming was continually interrupted by extradiegetic breakdowns that forced a constant switching between human and machine. *The Making of Silent Running* reveals a Russian doll enclosure of the film crew in the cramped underdeck of its aircraft carrier set and the actors in the Drone costumes. This created a tight human-machine layering that is mirrored in the rapidly cut camera-work darting between steady robotic movement and the pained expressions on Lowell's face. The camera-work was in turn also a result of physical breakdowns in the filming process and Dern's fear of the Drone's mechanical cutting tool (he insisted that a dummy leg be fabricated for the scene) (Kermode,

2014: 56-59). This series of diegetic and extradiegetic breakdowns leads to a constant exchange of expectation between what is human and what is machine.

3.14 Sequence 2 - Breakdown (Huey)

In a piece of human/machine on human/machine action Lowell/Buggy hits Huey/Sparks in a violent cyborg crash. The resulting breakdown spreads backwards in time through a breakdown in the Lowell/Valley Forge/Forest/Sun linkage. In addition to this, Huey/Drone 2's breakdown means that it can no longer work maintaining the forest. From this point the relationship between Lowell and Huey/Drone 2 intensifies and the machine becomes a part of a new intimate, emotional linkage. The film's narrative carries this relationship to conclusion with the suicide of Lowell/Huey. Drone 1/Dewey continues to tend the forest. The operation on Lowell and the repair of Huey can be understood as the super-thaumotropic event of *Silent Running*. Drone 2/Huey, once the surgeon is now the patient, its breakdown is signalled by jerky but limited involuntary movement of the mechanical arm. Just as in Lowell's injury, the focus of this breakdown is a hinge joint. Human knee and mechanical arm flash into view. Other symptoms of breakdown: piston noises and a repetitive whine are presented as the flip side of Lowell's staccato breathing and moans of pain. The ritornello of robot breakdown is blurred into the human, presequences and consequences whirl back and forth.

3.15 Sequence 2 - Repair

As is to be expected in this thaumatropic model, the repair scene of *Sequence 2* blurs with that of *Sequence 1* allowing the unstable ensemble Sparks/Drone2/Huey/Lowell/Dern to merge/emerge. Lowell is now the surgeon to Huey's patient with Lowell's monologue revealing a fully anthropomorphised relationship at work. Lowell talks of making Huey "more comfortable" and expresses understanding for Drone 1/Dewey's concern for his fellow robot. There is also an extradiegetic flip in filmmaking process. In *Sequence 2* extreme close-ups are replaced with shots that include Lowell and the Drone throughout. This must have been achievable because there was no need for radio controlled elements or manual puppetry, making more space for the camera. For the same reasons the rapid cutting of *Sequence 1* is also replaced with more sustained shots. However, one of

the central flips of these sequences takes place around the removal of Dern's trouser leg in *Sequence 1* and the unbolting of Dewey's casing in *Sequence 2*. Beyond the obvious narrative paralleling at work here, there is a material exchange revealed by the "Making of" documentary. The mechanical removal of Dern's trouser leg revealed not the actor's own leg but a simulacrum. Flip to *Sequence 2* and the manual opening of Dewey's casing exposes, not the body of Cheryl Sparks, but the wires and pistons one might expect to find inside a robot, an artificial replica of the machine. Dern describes this moment as:

Like an old magic trick- you take the shroud off and show
that there really isn't someone inside.

(Kermode, 2014: 74)

Slavoj Žižek talks about a similar, but diegetic moment in *The Wizard of Oz* (1939). In discussing the scene in which Toto pulls back a curtain to reveal Oz is merely a man operating a machine. Žižek notes that, in cinema, the audience is unperturbed, stating that:

There is something more real in the illusion than in the
reality behind it.

(The Perverts Guide to Cinema, 2009)

However, what Žižek suggests here is a separation between "illusion and "reality" and that reality, despite being creative of illusion, is somewhat unsatisfactory in comparison to its progeny. A thaumatropic view challenges this binary and causal relation by literally blurring their boundaries. Dern's evocation of the "old magic trick" a phrase that suggests quaintness and, like Žižek, foreknowledge that we are being fooled (we can be certain that there is or was someone in there all along). For Dern, the material mechanics of filmmaking are intimately connected to the illusions they produce. The removal of the shroud does not reveal an unsatisfactory truth, rather the material colludes with illusion in a flickering thaumatropic interchange.

In *Silent Running/The Making of Silent Running* this thaumatropic interchange is central to the anthropomorphic experience. The example of moving rapidly between

the machine(drone) that isn't a machine and the human(leg) that isn't human sets in motion a narrative and non-narrative material exchange⁵⁶. Here anthropomorphism is a part of the diegetic and extradiegetic blur of machine and human. The anthropomorphic machine (and mechanomorphic human) are materialised by and in turn materialise: machine, human, actor and viewer. Similarly, this ongoing process of materialisation continues as various breakdowns affect the spin of the thaumatropic model. As noted above, the seizes of human leg and mechanical arm cause a drawing in of the narrative focus on the hinge joints of the “machine-replaces-man-replaces-machine trick” that is the Lowell/Dern/Huey/Sparks body. At the same time this narrative seize is involved with a series of extradiegetic breakdowns or technical dilemmas. The cuts, seizes, and contractions of space that form the film making process highlight the linkages between bodies. The seize especially, with its capacity to draw focus, to slow and interrupt, raises awareness of the blurred relationship between human and machine. Using the models of the thaumatrope and the “Making of” form redefine anthropomorphism as a force that rises out of, and is involved in, this blurred creation. Thus, understanding anthropomorphism thaumatropically (with wonder) allows us to see it in multiple modes both as a function of a connection between human and machine and as an active part in this connection, part of our flickering inbetweenness, thoroughly material and disembodied.

⁵⁶ Again, this idea of material exchange against the odds relates back to the Deleuzian concept of love discussed in 2.23. Protevi's description of Deleuzian love “leading to adventures” (Protevi, Patton ed. 2003: 13) suggests it is like the Thaumatrope, a wonderful generative process.

3.2 Cyborgs of Transcendence

In sounding the breath of your engines, in urging
on fifteen tons of metal with your shoulders: the
problems confronting you are ultimately the
problems of all men, you share the nobility of the
mountain dweller with whom you are on a direct
and equal footing.

(Saint-Exupéry, 2000: 30)

In *Wind, Sand and Stars* (1939) Antoine de Saint-Exupéry sums up his Romantic thesis that the flying machine creates a purer connection with the forces of nature. He not only anthropomorphises the aeroplane but merges with it to create a powerful, if fragile, cyborg. Interestingly his most potent moments of connection with the world occur when he is flying blind, relying on instruments and glimpsed lights from below (2000: 71-78). In these instances, Saint-Exupéry is very like the Drone actors described in the previous sections, developing new contacts with the world while encased in a restrictive metal body. In becoming a cyborg, he also echoes the transcendent possibilities for human-machine interaction suggested by Asimov for whom transcendence and restriction also travel hand in hand⁵⁷. Additionally, my interpretation of Saint-Exupéry extends Merleau-Ponty's notion of being (in) the world to involve and even necessitate the machine. This section will look at the human/machine as an entity connected to, and a part of, the wider world. It will specifically examine ways in which humans have connected with machines to control their environment and become godlike⁵⁸. This idea is further developed by Rosi Braidotti in *The Posthuman Condition* (2013) in which she investigates the central humanist symbol of the Vitruvian man to unravel how, for Humanism, "difference spells inferiority" (2013: 15). The Vitruvian model and Da Vinci's drawing expresses the centrality of the young white male. In "On Symmetry" from *The Ten Books on Architecture*, 30-15BC Vitruvius describes the proportions of the

⁵⁷ Transcendence and restriction is a developing ritornello of *I Robot* in which the possibilities offered by increasingly sophisticated machine human interaction bring new limitations. For example, *Escape!* describes the invention of faster than light travel made possible through the aegis of a new AI, Brain. However due to issues with the laws of robotics although two human subjects travel across galaxies they are hermetically sealed in a featureless hull for the entire round trip without any free will whatsoever. (Asimov, 1950:137-158)

⁵⁸ Sociologist John O'Neill discusses the role of anthropomorphism, of transcribing human characteristics onto the divine and by extension allowing the human to become divine in his book *Five bodies: the human shape of modern society* (O'Neill, 2003: 46)

male figure centring on the navel and transcribing a perfect circle and square, he then goes on to relate these human proportions to those of the temple (Vitruvius and Morgan, 1914: 72). In doing this Vitruvius is describing a perfect anthropomorphic model leading from the human, through the machine⁵⁹ to the divine. This idea is taken further in the 1490 image by Da Vinci. Here the human is central to, and bounded by, shapes which are at once celestial and mechanical and recall the Copernican model of a universe based on the revolution of heavenly spheres, *De Revolutionibus Orbium Coelestium* (1543). Descartes closed the circle of this diagram of power when in 1637 he described the body as a "machine made by the hands of god" (Husbands, Holland and Wheeler, 2008: 309).

In this context, the following sections will examine the notion of godhood and restriction offered by the *Cyborg of Transcendence* and assess the effect of forms of breakdown on these human-god-machines and the anthropomorphic hegemony. To do this, it will employ the central examples of my looped film *Deus* and the first three people to plunge over the Niagara Falls in a barrel, Annie Edson-Taylor, Bobby Leach and Charles Stephens. As the fused nature of the cyborg demands, it will look closely at the interfaces of the machine-human-god and at the breakdowns that occur at those points of connection and separation.

⁵⁹ I am defining the temple building as a machine. Lafitte does the same in his *Réflexions sur la science des machines*, 1932, defining the simple dwelling as a passive machine (Iliadis, 2015:135). Guattari suggests the same thinking in stating that a wall is a protomachine (Conley ed. 1993:18)

3.21 The First Barrel Riders, the seize and cutting loose

My practice has been concerned with the actions of cyborg daredevils for six years. A fascination with figures such as Harry Houdini and Charles Blondin has led to pieces such as *Rope* (2014) which provided a live swaying image of a piece of darning thread stretched across the gallery space.⁶⁰

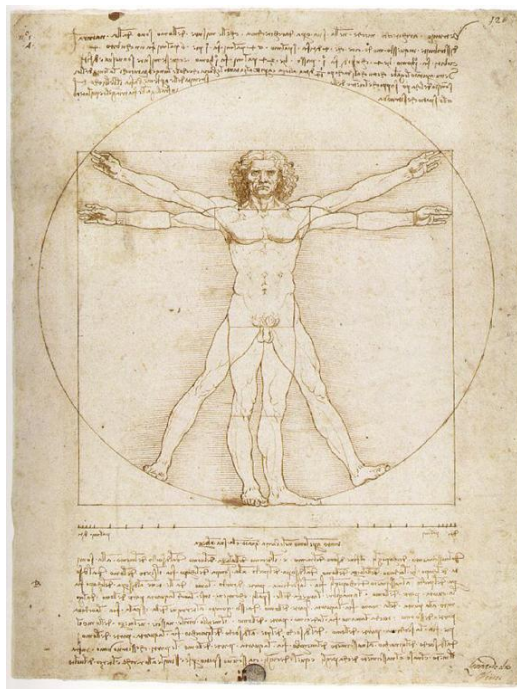


Alex Pearl, *Rope*, 2014

Both Houdini and Blondin are connected by the combination of the body with simple machines and mechanical repetition. Both performers were locked in a cycle reprising essentially the same act embellished over time. While Houdini would be chained in a postal sack, a milk churn, buried alive, only to escape and repeat (Kalush and Sloman, 2007: 219-221), Blondin would cross and re-cross Niagara

⁶⁰ A review of this piece picks up on *Rope*'s domestic undermining of adventure: "A second screen in Pearl's piece shows what at a glance seems to be an abstracted, paired down static, until you connect the grainy strand to the thin length of thread taped between the side of the monitor and the adjacent wall. A small camera peers down the length of the thread, which is transformed with surprising credibility into a rope across a vast clouded chasm, a simulated void. Dropping in then out of focus, the thread easily alludes to being Blondin's heavily concentrated next step. On the lower shelf of the plinth that the monitor sits on is the remainder of the *Peri-Lustra* darning thread used for the illusory tightrope. Its humble, worn scale humorously sews the seeds of the daring and perilous into the everyday and domestic. The interplay between darning and tightrope walking, between the void and the hole in a sock suffuses the piece with a layered playfulness." (The-page.org, 2017)

Falls: frying an omelette, carrying his manager, blindfolded (Banks, 1862: 33-41). The same can be said of elements of Roman Signer's practice in which he continually places his body in relation to threatening machinery. Signer's actions with fireworks in pieces such as *Bürostuhl* (2006) and *Nicht Loslassen* (1983) in which the artist holds burning rockets in various situations are examples of a new type of Vitruvian man, almost in control but also in danger. Signer refers to these actions as being transformative rather than destructive (Bitterli & Fiedler, 2014: 60), describing *Nicht Loslassen* as being about "becoming lighter" (2014: 83) and alluding to ascension in Christian mythology. Although far more quotidian, my own involvement in *Love Machines*, in which I took on the role of attendant to the machines, also extends this idea but presents a more domestic and understated relationship. A part of this shift in the human-machine dynamic is the decentralisation of the human in relation to the machine that occurs in breakdown.



Da Vinci, *Vitruvian Man*, 1490



Annie Edson-Taylor, 1901

When, in 1901, Edson-Taylor plunged over the falls in a barrel she was a destitute, 63-year-old, retired school teacher. She hoped the one-off performance would bring her enough fame and fortune to support her in her later years (Grundhauser, 2017)⁶¹.

⁶¹ Analogously the cyborgs of *Aliens*, *Matrix Revolutions* and *Elysium* (and others such as the *Terminator* series, *Robocop* and *Iron Man*) are also enacted at times of crisis. These crises are often the result of larger social breakdowns, financial inequality and corporate hegemony.

As Joan Murray points out in her biography of Taylor, her gender and maturity meant that this fortune never materialised and she was eclipsed by Bobby Leach who repeated the stunt in 1911. Leach, closer to the model of the Vitruvian ideal (a performer, athletic, male, his barrel engineered steel, more spaceship than beverage container) went on to make a financial success of his fame by recapitulating the act in lecture tours and performances (Murray, 1999: 94-6). Edson-Taylor is interesting here because her transcendence was curtailed, it began and ended with her juncture with the barrel.

In the publicity image above, the Edson-Taylor/Barrel cyborg is already dismantled. Without the ritornello of endless restatement, exhibited by Houdini or Blondin, the human-machine-god is diminished. Taylor is standing beside the barrel, its squashed cylindrical form a solid and practical equivalent of the perfect but insubstantial circle and square of Da Vinci's drawing. Taylor is also now peripheral rather than central to the machine, although one can't help but recognise the rhyme of the barrel's staves with the stays of her corset. The human/barrel cyborg functions through its own dissolution. In a reverse of the human birthing process the cyborg is born when the machine encases the human and dies when it 'rebirths' its human component. As this process suggests, there is something visceral in the junction between flesh and machine that marks the cyborg out. Both Taylor and Leach were bruised and cut while part of the machine⁶². To keep functioning the cyborg, like any machine, must repeat. This occurs through actual repetition of its function, or through a performed retelling. The Annie Edson-Taylor cyborg did neither. The goddess-like narrative of the "Queen of the Mists" was quickly interrupted by a contracting seize and Edson-Taylor was returned to poverty.

In 1920, when Charles Stephens attempted an identical feat, the cyborg broke apart prematurely. This breakdown, a form of *cutting loose*, occurred when the weight of an anvil, chained to Stephens' ankle, smashed the barrel as it hit the bottom of the falls. The event was a grisly example of the violent expansion and move towards freedom associated with *cutting loose* (see [2.54](#)). While most of Stephen's body and

⁶² This visceral conjunction is often expressed more literally in Science Fiction films such as *Elysium*, 2013 and *Matrix*, 1999 which revel in the marks left in the flesh of their human components.

the anvil were never recovered, an arm was found, still attached to the barrel's internal strapping. Here the forces applied by *cutting loose* caused the formation of new individuals. *Cutting loose* is a dangerous form of Malabou's destructive plasticity (2012: 29), it forces us to step aside from the Vitruvian hegemony and its insistence on the purity of the whole, bounded body. *Cutting loose* reveals that the edges, the junctions between, say, arm and strap or ankle and anvil are as important as arm and shoulder. The forms of breakdown illustrated here are shown to have significantly different effects on the Vitruvian cyborg. The seize reveals the temporary nature of the human-machine body and that is supported by repetition, whereas *cutting loose* raises the question of where the body's boundaries are drawn and how suddenly they can change.

3.22 *Deus* – Play, Unbalance and the Vitruvian Man



Deus, 2017

*Deus*⁶³ (2017) can also be experienced as a light-hearted meditation on the Vitruvian cyborg. Presented as part of a group exhibition *Our Friends Electric* at Quad, Derby, it appeared herm-like on a plinth mounted monitor. The herm is an Ancient Greek and Roman form of sculpture consisting of a portrait bust on a pillar often with “heroizing connotations” (Dillon, 2012: 31). Early forms of this cyborg form

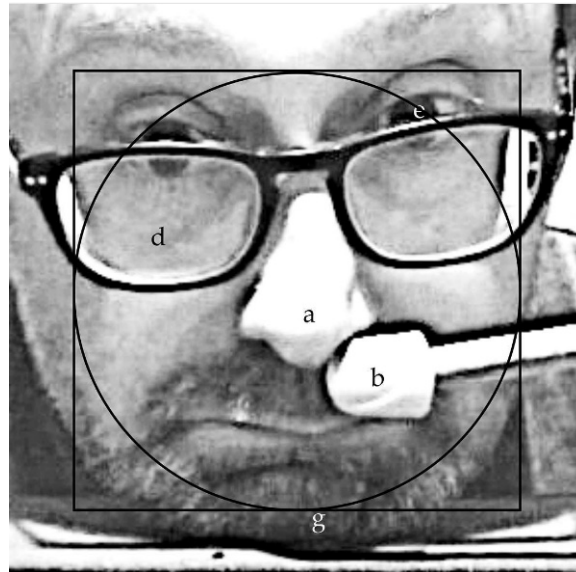
⁶³ See *Breakdown Manual* p.221

combining the human body with the geometric elements of either cylinder or cuboid were employed as protective devices⁶⁴ marking boundaries and were often adorned with, usually erect, male genitals (Johns, 2000: 52). *Deus*, while it does not possess this archaic embellishment, does allude to the erect phallus via the regular prodding of the nose by the mechanical 'finger'. As this finger pushes the nose and probes the nostril it is hard to avoid its absurd sexual overtones. Although the impassive face of the artist and the off-screen straining of the motor suggest an unsatisfactory union. Sexualised machinery and mechanised sexual action are of course not uncommon anthropomorphic and mechanomorphic phenomena and are already implied in my invocation of Deleuzian love in 2.23. Amin Zweite evokes an anthropomorphically sexualised interpretation of Rebecca Horn's work, citing Diderot's *Les Bijoux Indiscrets* (1748) (in which female genitalia are made to speak by means of a magic ring) and the way in which Horn's machines repeat "rhythmical tasks" (Horn and Zweite, 2005: 26) and are seen to "flirt, quiver and sigh" (2005: 27). Correspondingly John Cleland repetitively (twenty-nine times) refers to male genitalia as a 'machine' or 'engine' in his 1749 novel *Fanny Hill* (Cleland, 2012). Science fiction film has also explored the theme of sexualised union between human and machine in detail, raising themes of violent obsession (*Saturn 3*, 1980, *Demon Seed*, 1977), obstacle riddled connection with the other and farce⁶⁵. *Deus* is not quite

⁶⁴ In its protective role, the herm can be compared with the Vitruvian science fiction cyborgs mentioned in 3.2 which, in each case, act as guardians for the weak.

⁶⁵ In *Blade Runner* (1982), *Cherry 2000* (1987) and *Her*, (2013), for example romantic relationships are set up between humans and machines that are interrupted or complicated by differences between thought and programming. Other films take these relationships to farcical levels with the orgasmatron *Sleeper*, (1977) or when Rocky's brother-in-law reprograms his robot servant to be a subservient love slave *Rocky IV* (1985).

any of these things. In an image presented in the catalogue for *Love Machines* a screen shot from *Deus* is overlaid with the Vitruvian square and circle and letters that ape mechanical diagrams. The nose (a) has been substituted for the navel and the prodding finger (b) is about to displace it. As the video progresses variation is introduced into the repetition caused by nasal elasticity and play in the machine's mechanism.



Love Machines catalogue image, 2017

The concept of the centre and balance is important to mechanical rotation a concept that lies at the heart of machine kinematics. If a cam is mounted off centre or is unevenly weighted this will lead to rotating unbalance, play, vibration and failure (Shabana, 1996: 155). As described in [2.51](#) play has many causes and is also generative of further breakdown. Play allows new associations, it is a force of excess and transgression. Specifically, mechanical play is the source of variation in *Deus* and it is this that also leads to a notional play with expectation and canonical norms. In mechanically pushing and tugging the nose off centre *Deus* unbalances the Vitruvian machine and creates a new emphasis on wider connections outside of the frame of the visible. This decentring is initiated by the audio content of the video which draws attention to the right, and off-screen.

Brian Aldiss' *Frankenstein Unbound* (1973) like many science fiction novels of this era⁶⁶, has a plot in which overwhelming dynamisms buffet its main characters. An unwilling time traveller is transported by out of control forces back to various points in history which intersect with the creation of Frankenstein's monster. Fact and fiction is blurred as he meets Mary Shelley and Victor Frankenstein in the fracturing landscape around Geneva. Towards the end Victor Frankenstein's dying words, as he sees his monster (machine) escape, are a telling reminder of the terrors of the Vitruvian man.

A purpose must be found, invented if necessary, a human purpose, *human*, putting *us* in control, fighting the *it*ness of the great wheeling world.

(Aldiss, 1985: 190)

Frankenstein is fighting the inevitable and his chief anxiety is one of rotational unbalance, that things are spinning out of control. Braidotti also picks up on the fear of unbalance which she sees as a product of the posthuman condition:

The posthuman provokes elation but also anxiety (Habermas, 2003) about the possibility of a serious de-centring of 'Man', the former measure of all things.

(Braidotti, 2013: 2)

Although coming at the issue from the angle of rehabilitating the machine into culture, Simondon also uses the imagery of unbalance to describe the separation of the technical object from the world of meaning:

Culture is unbalanced because, while it grants recognition to certain objects, for example to things aesthetic, and gives them their due place in the world of meanings, it banishes other objects, particularly things technical, into the unstructured world of things that have no meaning but do have a use, a utilitarian function.

(Simondon 1958: 27)

⁶⁶ Kurt Vonnegut's *Slaughter House 5*, 1969, Isaac Asimov's Foundation Trilogy, 1953 and Philip K. Dick's, *UBIK*, 1969 for example all have plots involving futile struggles against entropic forces.

Simondon sees this unbalance as being at the root of human anxieties about machines. This anxiety is further explored in the writing of Virilio in which he probes the cost of technology and impact on the human body (Virilio & Lotringer, 2007: 220). Virilio's symphorophilic fascination with the violence of technology is comparable to the junctions of meat and machine enacted in J.G. Ballard's *Crash* (1973) except that, for Ballard, there is a sense of the creation of new bodies, configurations of chrome and flesh that rhyme with their concrete environment. (Ballard, 2011: 116)

In these fictional and philosophical positions the language of decentring, unbalance and physical damage reveal the anxieties caused by the playful breakdown. Still, if one of play's features is to unbalance, then at the same time it creates new configurations beyond the Vitruvian norm, beyond human purpose. Here play in the machine-human relationship must be considered as a motor force in the "anxiety and elation" of Braidotti's concept of the posthuman.

3.3 The Mechanomorphic Human



Rocky IV, 1985

Throughout *Rocky IV* (1985) the Russian boxer Ivan Drago (Dolph Lundgren) is presented as a machine-like athlete. Metronomic and monosyllabic, his punches are measured by computers, his training performed while attached to machines. Given that this mechanomorphic characterisation is bracketed by Arnold Schwarzenegger's appearance in *Terminator* (1984) and Lundgren's return as a zombie cyborg in *Universal Soldier* (1992) an audience could not fail to understand that the mechanomorphic human represents an implacable danger but also something that will ultimately fail. Obversely Rocky's training takes the form of an extreme back-to-nature retreat. Rocky becomes an elemental figure: running through snow, chopping wood, and lifting rocks. *Rocky IV* presents a hierarchy, empowering the human and raw material over the assembled technical object. This is summed up in two lines at the turning-point of the fight when Rocky's corner-man yells "He's not a machine he's a man" and Drago is translated as saying: "He is not a man he is like a piece of iron." Subsequently Rocky's victory is presented as one of the human over the machine.⁶⁷

However, *Rocky IV* is also a tragedy of mechanical breakdown in which the USSR, a smoothly functioning symbiosis of humans and machinery, is undermined by the lone American. As the concluding fight takes place, Rocky acts much like a computer virus or a cascading failure⁶⁸. From the central point of the boxing ring his

⁶⁷ Not just the machine but also the machinery of state, as Terry Christensen, William Palmer and others have noted this mechanomorphic trope of heroic individual versus machine-like collective was fully entangled in Reagan era politics and attempts to undermine the USSR (Haas, Christensen and Haas, 2015: 176) & (Palmer, 1993: 219).

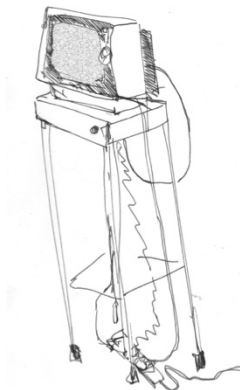
⁶⁸ Hines describes cascading failure as the process by which small disturbances in a system can "trigger long chains of cascading component failures" (Hines, Balasubramaniam and Sanchez, 2009: 24)

influence spreads causing ripples of affect through the crowd. By the end of the sequence, first a few people and then everyone is chanting “Rocky”, they have become “Rocky”, “Rocky” has replicated himself through the system causing consternation among the gathered officials. *Rocky IV* reveals two seemingly opposite forces at work in the mechanomorphic process, both based upon anxiety. Firstly, the anxiety is that machines repeat and keep repeating with a relentlessness that overwhelms. Secondly there is the anxiety that machines will inevitably fail. With these anxieties in mind Lafitte and Haraway’s assertions that “the machine is us” (Haraway, 1991:180) (Lafitte, 1932/1972: 101) imply further cause for disquiet, namely that we are repeating machines and that we will cease.

3.31 Humans and Machines – *Machine 19* and the *Selfie*

To explore the anxiety of inseparability further, this section will examine human interactions with *Machine 19* (2017). Here, *Machine 19* serves as a foil for the anxiety created by the machines-as-other/machines-as-us and repetition/breakdown dichotomies described in 3.3. It does this by emphasising the role of mechanomorphism as a connective force and undermining the boundaries set up by ascription.

Machine 19 is a development of the sound activated camera *Machine 9* (2015). It takes the form of a black and white television set mounted on an unstable Formica plinth. Hidden in the plinth is: a miniature camera, a sound activated power unit, and a digital-to-UHF convertor. The television is powered continually whereas the camera is only activated in response to sound within the space. This means that much of the time *Machine 19* appears not to be functioning. The form of the piece is



Drawing for *Machine 19*, 2017



Pozitron Display Robot, 1971



Moon, 2009

anthropomorphic in that it is of average human height and the television set/camera assemblage can be interpreted as head-like. Its design recalls depictions of robots and artificial intelligences from recent films including: *Moon*, 2009 and *WALL-E*, 2008. Earlier iterations such as this 1971 display robot (above centre) made by the Russian electronic company Pozitron and Nam June Paik's *Robot Family* first shown in 1985 (Tate.org.uk, 2017) belong to a similar phylum. These anthropomorphic forms, assembled from old television sets, carry with them the pathos of obsolescence that creates a comfortable connection between the human and the technical object.



Visitor making a Selfie with *Machine 19* (2017)
Pixelated for anonymity.

These images of *Machine 19* were taken from a short film posted on Instagram by one of the visitors⁶⁹ to *Love Machines* (2017). It shows a common interaction, the making of a selfie. To take a selfie with *Machine 19*, the visitor must first create and sustain enough noise to keep the camera active. After some experimentation, this usually takes the form of singing a single note of sufficient duration to take a picture. The assumption made by the visitor here is that if no sound is being produced then the TV camera assemblage is not functioning and that the sustaining note completes a linkage that pulls the machine back from breakdown. Thus, the call of the visitor, stimulated by anxiety, brings about the material exchange of Deleuzian Love (image for sound)⁷⁰. Aaron Hess in his article “The Selfie Assemblage” explores this juncture of machine and human further stating:

More than just pictures, selfies underscore the relationship between the body and digital technology through the relational corporeal composition with the device and through the networked spaces selfies are destined to travel in.

(Hess, 2015: 1640)

⁶⁹ I use the term visitor here to denote the temporary interaction of human body with the machine. In addition, the term refers to *Machine 19*'s exchange of sound for vision.

⁷⁰ See [2.23](#)

The relational cyborg body described here is a continuation of the flickering exchange between machine and human described above. It is also part of a process by which the human body moves from a central Vitruvian position to a part of a networked assemblage. This process of decentralisation is exaggerated by *Machine 19* as it draws sound from the human body with the lure of function. Indeed, while *Machine 19* has the normative trappings of breakdown (flickering, loss of image) it functions much in the same way as the broken wing act of the Plover⁷¹. This diversion extends the selfie taking procedure as the visitor must engage sonic, haptic and visual skills to become a part of the machine's function. The decentring of the visitor is developed further when one considers the role of *Machine 19* as a producer of *veillance*⁷². Although *Machine 19* uses the same configuration of technology used in surveillance CCTV, the relationship it creates is completely different. Closed circuit television sets up a situation in which the human's actions are recorded for an authority or its proxy (Mann, 2013: 3). However, in this case, the image produced is viewed either by the visitor or (if, for example, the camera is activated by a passing bus) by no one. Neither does the imagery produced by *Machine 19* fit neatly into Mann's definition of *sousveillance*.

Observation or recording by an entity not in a position of
power or authority over the subject of the *veillance*.
(Mann, 2013: 3)

Instead *Machine 19* disperses power through the procedures activated by its perceived breakdown, the visitor's call and the machine/human which is brought temporarily into being. Watching the Instagram video the visitor is seen to shift position, she is suddenly inside the machine and outside the machine, activator and activated. Through this thaumatropic process the visitor becomes part of an aural and visual ritornello temporarily territorialising human and machine. In discussing the ritornello, Anne Sauvagnargues characterises Guattari's image of the child singing in the dark as an outline or "portable shelter" something which allows it to

⁷¹ David McFarland uses the example of birds that will draw predators away from their nests by feigning injury to explain simple communication systems between different species (McFarland, 2017: 66).

⁷² *Veillance* is a term used by Steve Mann to denote a neutral form of watching via technical objects (Mann, 2013: 1)

gain equilibrium, a centre (2016: 130-2). This idea of creating a centre and an outline is integral to the interaction between human and machine here. In singing for a selfie the machine and visitor become part of a spatiotemporal juncture which fleetingly designates a body. Crucially this body is not made by the visitor or the machine but by the sung note and the phosphorescent light of the cathode ray tube.

3.32 The Meat Machine – Repairing *Love Machines*, Minsky & Asimov

The previous section has shown that mechanomorphism is part of a process where the human body is decentralised and brought into a larger system. This observation is also borne out by the role of the artist as repair person exhibited in *Love Machines* and *Denis ex Machina*. The artist's role in both these exhibitions has been characterised by a more accepting attitude towards the breakdown of the technical object. The artist is seen to be working with breakdown: sometimes repairing, sometimes replacing, sometimes reconfiguring. Because of its long run, often the challenges of the breakdowns in *Love Machines* led to completely new and



Machine 35 before and after breakdown

unplanned configurations of artist and machine parts. For example, after two weeks

of smooth function the machine (*Machine 26*) used to prod my nose in *Deus*, now recruited into a new role as part of *Machine 35* had worked its way to the edge off its temporary plinth (D) and crashed to the floor. Its parts scattered and broken, the main cam assembly (C) continued to turn causing what was left of the machine's body to writhe and emit a scraping noise.

When I discovered the remains of *Machine 35*, I had recently had an accident of my own. While descending a wooden staircase in my socks I had slipped and fallen awkwardly damaging the ligaments in the thumb of my dominant hand. Now, in heavy strapping, my thumb was only capable of the weakest of movements without painful feedback. In the preface to *An Anthropologist on Mars* (1995) Neurologist Oliver Sacks begins with his own physical breakdown. Writing with his left hand following surgery on his right, he uses the image of his struggle to relearn simple tasks. Introducing the idea of the plasticity of the human brain, Sacks describes “the loss of self” and, the “preservation of self” in neurological disorders as being too simplistic (Sacks, 1995: xvi). Rather he presents the idea of transmutation of the self as a result of altered reality, a “metamorphosis into alternative states of being, other forms of life” (1995: xviii). My own experience of the mechanical happenstance of the breakdowns of camshaft (A) and thumb extends Sachs’ observation beyond the human body. The repair of the machine affected by the injury to my hand⁷³ called for a transmutation not only of the machine but also of the layout of the exhibition. Some parts of *Machine 35* and associated objects became redundant. Notably the projection screen that the machine had been poking was folded up and left standing to one side. The tension of its erection released, its function was transformed from an active part of a machine to a passive bystander. Here “The self” that had been transmuted by this parallel breakdown went beyond the human body to include the body of the machine and of the ensemble of machines and human that made up exhibition. In this way



Machine 35 reconfigured

⁷³ The methods of repair were altered by my reduced dexterity and the painful need to complete the task more quickly than before. Furthermore, my injury made it impossible to return the machine to its original state. Instead the machine was reconfigured with screen folded and placed to one side. The parts of cam shaft (A) were taped back together and cam unit (C) was screwed onto the side of plinth (D).

breakdowns can shift focus from the idea of the body as a contained whole to a new multiple focus on many parts and events: the hinge joint of the thumb, revolute joint on the cam, the grinds, squeaks, flickers, judders, cessations and movements of *Love Machines*. At the same time, these gestures create a ritornello of connection anew. If I move my thumb by my ear I can still hear the joints crunching and the grind of the repaired machine. This is what mechanomorphism is, the scattering of the body into parts.

The aggregate of parts is at the heart of Asimov's idea of machine intelligence. In "Catch that Rabbit" (1950: 71-91) robot trouble-shooters Donovan and Powell are sent to discover the reason for a malfunction in a mining robot assemblage made up of a "thinking unit" called Dave (DV-5) and six slave units.

Look, that robot, DV-5, has six robots under it. And not
just under it – they're part of it... Those six subsidiaries
art part of DV-5 like your fingers are part of you
(1950: 72)

Crucially DV-5's tendency to break into musical cabaret rather than do its job is not merely ascribed to a breakdown in its positronic brain. Instead the roboticists base their diagnosis on complex relationships between mechanical parts, environment and programming with the idea that behaviour is built out of the interaction of a multitude of simple components. The idea of complexity⁷⁴ is central to the content and structure of Asimov's robot oeuvre. Like DV-5 and its "fingers" each of the 37 short stories stands alone but also functions as part of a whole.

These concerns are also central to the work of AI pioneer Marvin Minsky⁷⁵. His first book *Society of Mind*, 1985 follows *I, Robot* both in terms of central themes and

⁷⁴ Melanie Mitchel defines a complex system as: "a system in which large networks of components with no central control and simple rules of operation give rise to complex collective behaviour, sophisticated information processing, and adaption via learning or evolution." (Mitchell, 2011: 13)

⁷⁵ In a reference to Asimov's protagonist Dr Susan Calvin, Minsky often described himself as a robopsychologist (Teitelbaum, 2017) blurring the human-machine and fact/fiction dualisms, acts central to his approach to developing AI. Minsky was a friend of Asimov as well as other science fiction writers such as Carl Sagan, Arthur C. Clarke and Robert. Minsky's interest in science fiction and relationships with its writers is described in one hundred and fifty-one talking head videos published online at: <https://www.webofstories.com/play/marvin.minsky/1>

structure. *Society of Mind* is made up of thirty chapters each broken into between five and twelve micro-chapters (three hundred in all) each a page or less in length. In the prologue, Minsky parallels the structure of his book with his understanding of the structure of the mind, that is of a society made of a multitude of simple “mindless” agents interacting⁷⁶ to form intelligence (1985:17). At the heart of the content of *Society of Mind* is Minsky’s assertion that the human mind is a “meat machine” (Turkle, 2005: 351) and his attempt to use this as the basis for building intelligence from the most basic materials and rules. Just as in *I Robot*, the complexity in Minsky’s book emerges out of this “entanglement of matter and meaning” (Barad, 2007: iii) and continued modification of one rule by another.

All the above could suggest that we are setting up a dualism, separating “rules” and the forces they imply from inert “matter”. However, Karen Barad’s “performative account of material bodies” (Barad, 2007: 139) suggests that the two cannot be so easily divided. This idea is also borne out by Minsky’s understanding of the brain which describes an interacting plasticity of matter and rules:

brains use processes that change themselves-and this means we cannot separate such processes from the products they produce.

(Minsky, 1986: 288)

The role of the artist as repair person in *Love Machines* has led to a greater awareness of the machines’ material components and the organising and disorganising forces (rules) that are generated by them and generative of them. It has highlighted that the human is not a separate, fixed or delimited body but rather that its components are fully involved with these same organising and disorganising forces. It has also introduced the role of rules, not as single organising forces but as interfering forces: human rules, physical rules, gallery rules, create generative clashes, rules are a force as much as motion and heat. The shift in *Love Machines* epitomised by the dispersed and decentred relationship between artist and machines

⁷⁶ Minsky uses the words “tangled webs” and “cross-connections” to describe the chaotic nature of his interacting agents, language developed by Donna Haraway in “A Game of Cat’s Cradle” (Haraway, 1994) and Karen Barad in *Meeting the Universe Halfway* (2007). The latter part of Barad’s subtitle ...*the entanglement of matter and meaning* could easily be used as a subtitle for both Asimov’s and Minsky’s work.

nudges the Vitruvian model and decentres the human so as not to privilege mind over matter but instead to see each as constitutive of the other. The heart of *Love Machines* is where rules and materials clash: human rules, rules of physics. At the heart of these clashes are the signallers of their interaction: smoke, squeaks and sweat.

3.4 Paramorphism⁷⁷ - boundaries revisited

The beginning of this chapter evoked the image of this research as a crashing aeroplane. Having picked up scars and debris from the three impacts described above, it will finally come to a rest. The plane still exists but its parts are scattered and reconfigured. Its three impacts have revealed that:

- a. Anthropomorphism and mechanomorphism, rather than being ascribed by one (superior) body on another, are forces rising from and involved in, the blur of human and machine. They are part of an unfixed relationship of inbetweenness.
- b. Play and the seize are breakdowns that de-centre the Vitruvian body, moving it from a position of control and superiority.
- c. The symptoms and gestures of breakdown are formative forces, spatiotemporal junctures that fleetingly designate a body.

The following sections will employ these impacts and the repair of *Machine 35* and *Machine 28* to take off again. Its new flight will propose that a term taken from minerology (paramorphism) via Italo Calvino's short story *Crystals* (1967) can be used as a model for understanding how the gestures of breakdown are the central motive force in the dispersal and formation of new bodies.

⁷⁷ A discussion of the mineralogical origins of paramorphism can be found in the glossary.

3.41 Paramorphism

If the substances that made up the terrestrial globe in its incandescent state had had at their disposal a period of time long enough to allow them to grow cold and also sufficient freedom of movement, each of them would have become separated from the others in a single, enormous crystal.

(Calvino, 1976: 28)

I believed so firmly in that world of crystal that was supposed to come forth that I can't resign myself to living still in this world, amorphous and crumbling and gummy,
(Calvino, 1976: 28f)

The dissatisfaction expressed above by Italo Calvino's protagonist Qfwfq is much like Aldiss' Frankenstein railing against "the great wheeling world" (1985: 190) (discussed in 3.22). Both characters are seeking a sense of stability. However, where Frankenstein creates a duality between humanity and the "itness" of the universe coupled with a desire for a Vitruvian centrality, Qfwfq desires something altogether different. For a start Qfwfq is not merely human, he(?) appears in several forms in Calvino's writing⁷⁸. In *Blood, Sea* he is, simultaneously, a man in a car crash and an amoeba living in a primeval sea of blood (Calvino, 1976: 39-51) and in *Crystals*, quoted above, he is a businessman working in contemporary New York with memories being a part of a primordial crystalline world (1976: 28-38). In both stories, Calvino presents worlds in which the boundaries between interior space and exterior space are broken down. In *Blood, Sea* Qfwfq laments the move from integration in a boundless liquid universe to sealed bodies of blood able only to ape their previous connections⁷⁹. The same theme of loss and connection is picked up in *Crystals*, where Qfwfq, like Frankenstein, is yearning for a world of negentropic order and stability to replace the crumbling 'gumminess' of his current existence. In these examples both Qfwfq and Frankenstein are seeking a world of connection but

⁷⁸ Qfwfq appears in short stories collected in: *Cosmicomics*, 1965, *T Zero*, 1967, and *Numbers in the Dark and other stories*, 1984.

⁷⁹ This primeval connectedness is never restored, even at the end of the story when Qfwfq's blood is released in a car crash he describes the spattering gesture only as an "infinitesimal detail" of the "arid outside" (1976:51).

with one important distinction, whereas Frankenstein hopes to place himself in a position of separation and control. Qfwfq's desires are ones of dispersion and amalgamation; while Frankenstein wishes to retain the boundaries of his body, Qfwfq does not⁸⁰. Qfwfq's existence in *Crystals* also does for time what it does to space. Pivoting it on the vertices of a crystal, Calvino presents a temporal flickering between the present and the memories of his protagonist. This idea is developed by Deleuze in *Cinema 1* (1983). Here Deleuze's crystalline view of the cinematic image condenses: "like shimmering crystals, the temporal relations or interactions among images of events and things preceding and succeeding or coinciding with their appearance." (Olivier, 2016: 5). This is what Constantine Verevis describes as "the moment of the crystal, where past and future collide; the moment where repetition is the eternal return: difference repeating." (Parr 2010: 250)

3.43 The Paramorphic Repair of *Machine 28*



Repair, 2017

Repair (2017) is a short documentary video of *Machine 28 (Self-Regarding Machine)* undergoing repair. Play in the cam drive has caused the cam belt to slip. The video shows two views from the machine while the repair is made. On the left (above), recorded by an external video camera, is an image of the live feed produced by the machine. The image inverted both tonally and in orientation and subject to numerous breakdowns in translation and interference (see [2.23](#)). *Repair* cuts

⁸⁰ In, *The Universe of Things: On Speculative Realism*, Steven Shaviro approaches the same idea with his concept of *contact-at-a-distance* (Shaviro, 2014: 61, 118, 147-148) and his description of a non-cognitive connectedness with the world (2014: 147).

between the views of the external camera filming the machine's live televisual output and its internal camera secretly recording the physical interactions of repair. The flickering viewpoint recalls the diegetic and extradiegetic flickers in *Silent Running* and *The Making of Silent Running* discussed in (3.1). Here, however, rather than revealing anthropomorphism as a force rising out of, and involved in, the blur of human and machine, *Repair* sidesteps anthropomorphism altogether. The human is not made machine like nor is the machine imbued with human qualities, instead the two overlap and intermingle. In this way, the video records a paramorphic restructuring over various timescales surrounding the event of breakdown. The call to the artist; moments of crouching and touching; changes in kinetic signals between parts of the machine and arms and fingers, the flicker of the decayed TV image; the artist brought temporarily into the machine; breakdown in the machine leading the brain to make corrections; joints and levers in action; the turning of the motor and the beating of the heart; photonic firings on the TV screen and movements of the artist's head.

Karen Barad describes matter as a “*congealing of agency*” (2007: 210) But this is too solid an image for the dance of flesh and machine experienced here. By employing the machines of *Breakdown*, Sauvagnargues' understanding of the ritornello and Deleuze's concept of love it is possible to apprehend the signals and gestures of breakdown and function as ritornellos of material exchange. These in turn create drifting junctures within which bodies dispersed and reconnected. Here the concept of the juncture is an important one as it describes not a fixed point but a sliding temporal connection/disconnection. *Love Machines*, in particular, is a paramorphic exhibition. In centralising the signals of breakdown and function rather than the object, it steps aside from the normative gallery/museum response to the non-functioning art machine as a problematic object. Additionally, *Love Machines* shifts the position of the artist from the Vitruvian centrality of producer to a more unstable position. *Love Machines* is both diegetic and extradiegetic in form, the audience is presented with the exhibition and “the making of” the exhibition. At the same time, the artist is dispersed by breakdown as he becomes: a repair person, a quasi-performer, an apologist. In these roles, he diffracts, becoming a part of the interference patterns of the gallery space. As the artist's focus shifts continually between the signals of breakdown and function and the processes of breakdown,

repair, alteration and replacement he is dispersed and held by the signals and gestures of the machine.

CONCLUSION

- i. Research Outcomes: Contribution to Practice and Theory
- ii. Summary of Thesis content, research question and methodology
- iii. Impact on my practice
- iv. Future post-doctoral study

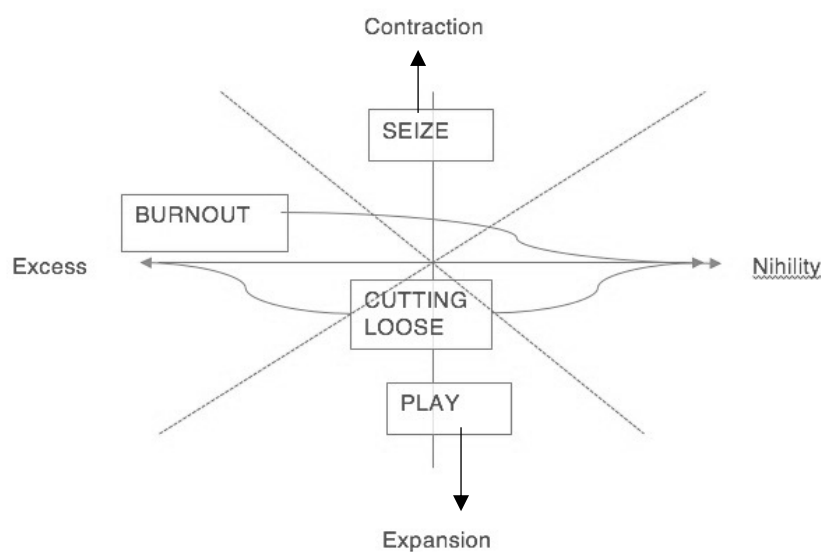
i. Research Outcomes: Contribution to Practice and Theory

This practice-led research has sought to develop an alternative attitude to exhibition of the technical art object in breakdown. In place of the dominant exhibition strategy that seeks to elide the non-functioning art object, I foreground the processes of dysfunction and repair. Throughout the exhibition of the machines of *Breakdown* my role slipped between repair person and artist; a fluctuating presence in the gallery space. This unstable positioning avoids being defined as performance art but is non-the-less performative in the relational sense described by Karen Barad⁸¹. In response to the fuzzy boundaries inherent in this indistinct role my methodology identifies four personas: *The Diagnostician*, *The Symphorophilic*, *The Fiddler* and *The Executioner*. Rather than distinct personalities, I characterise these roles as forces acting simultaneously within the exhibition space. This new approach to the exhibition of the technical art object creates an open ground for the study and understanding of breakdown beyond the normative assumptions of function and non-function. As a methodological tool it draws the artist, technical art object and audience into a fluctuating set of relationships that cluster around, or are dispersed by, the symptoms of breakdown. This in turn has revealed breakdown to be more than a stereotyped revelatory phenomenon as typified in the writing of theorists such as Virilio, Baudrillard and Barad. It should be noted, however, that these four performative personas should not be considered an exhaustive list. Arising at slipping junctures, these personas may shift and morph. Additionally it is certain that with each new interaction new personas can appear. *The Fiddler*, for example, is characterised in this text as a simultaneously restorative and destructive interaction drawn in by play and the seize and linked to childlike exploration. However, *The Fiddler*, can also become a performer. Drawing on musical personas from jazz improvisation the idea of the fiddler as an inwardly facing performer, working with the machine (instrument) and led by musical repeats and breakdowns can be developed. Elements of this performing fiddler can already be seen in Rie Nakajima's recent performance at the Ikon, Birmingham <https://www.ikon-gallery.org/event/rie-nakajima/> in which the artist, kneeling on the floor with an

⁸¹ i.e. that objects are enacted through a set of relations (Barad, 2007: 139)

array of mechanical devices shepherds them in an intimate series of delicate ritornellos.

Through the adoption of the four personas identified above, I have challenged the blackboxing of breakdown and identified four types of mechanical dysfunction each with a differing gestural language and affect. *Seize*, *Play*, *Burnout* and *Cutting-loose* are each defined in [Chapter 2](#) in terms of their symptomatic language of expression and the forces they impart. Rather than characterising these forms of breakdown as revelatory I attend to the specific gestures they express and their effect on the components of the machine and the human. Again it is important to state that these four forms of breakdown should not be considered final. Rather they were chosen as representative of types of breakdown acting with distinct (though interlinked) gestures and affect.



This diagram, first used in [2.61](#), sketches out these gestures but also leaves room for many types of breakdown between its axes of excess, nihilility, contraction and expansion. During the exhibitions - *Denis ex Machina* and *Love Machines* (2017) - several of my machines recorded our interaction while I attempted to make repairs. This continual recombination of human and machine components highlighted the importance of the gestures of breakdown, its squeaks and cessations, in orchestrating the formation of new human-machine bodies. It is around these mechanical gestures, I argue, that the machine-human body is temporarily formed

and dispersed. To describe these momentary bodies, I use the term *Juncture*. Appropriated from linguistics *Juncture* expresses, not a fixed junction of bodies but a sliding moment of change between them that in turn defines those bodies. *Juncture* is a useful term in bringing together Barad's performative account of material bodies with Deleuze's concept of the material exchange and adventure of *Love*. In emphasising the importance of the specificity of the mechanical gesture in the formation and dispersal of bodies I move the concept of breakdown beyond the purely revelatory.

In showing that forms of breakdown are intimately involved with the dissipation and reformation of bodies I reposition anthropomorphism beyond the ascriptive and the current binary of 'good' and 'bad'. Here the thesis is not concerned with how and why anthropomorphism is generated or even what it reveals about our relationships with machines. Instead anthropomorphism is treated as both symptomatic of forms of breakdown and as an affective force in crystallising the personas adopted in this research. It is also important to understand anthropomorphism as part of a thaumatropic event arising from the human-machine blur. This blur is itself recognised in the writing of the thesis in its continual flickering between the use of the *machine-human* and the *human-machine*. Specifically, observations of: my machines, science fiction robots and the Niagara barrel riders show how anthropomorphism and mechanomorphism are triggered by forms of breakdown. From this I identify that anthropomorphism and mechanomorphism are not ideas overlaid onto the machine and the human but instead they are a part of an ongoing restructuring process. I call this process *Paramorphism* a term borrowed from mineralogy. Central to the idea of the paramorphic is that it describes a change in crystal structure rather than chemical content, a moment of turmoil and stability, a blur of anthropomorphism and mechanomorphism. In the paramorphic model the machine-human body is dispersed and held by gestures; smoke, squeaks and sweat.

ii. Summary of research question, methodology and thesis content

In exploring the research question: What does *Breakdown* reveal about the anthropomorphic relationship between humans and machines? The word *Breakdown* had a dual role. It described a body of work comprising 36 *breaking-machines*, their

exhibition, ongoing repair and reconfiguration as well as standing in for many forms of mechanical dysfunction. The formulation of this question led to, and was engendered by, a methodology that closely interlinked praxis, theory, fiction and document. Chiefly, the exhibition of these *breaking-machines* led the way in looking for a set of machine-human relations that cluster around breakdown. The necessity of presenting machines that must fail and must also be kept going for the duration of an exhibition also led to a change in the role of the artist. Rather than the Vitruvian paradigm expressed by James Joyce in *A Portrait of the Artist as a Young man* (1916)

The artist, like the God of the creation, remains within or behind or beyond or above his handiwork, invisible, refined out of existence, indifferent, paring his fingernails.

(Joyce, 1922: 252)

Breakdown drew me in to a new relationship with my work that moved between artist and repairman. The *play* in this performative role is one example of the way in which forms of breakdown are not only examined but also lead the thinking in this research.

The design of the thesis has also deliberately followed the assembly of a machine with many parts transferring and being moved by forces along the linkages of writing. The thesis design recalls the technical manual in its structure and format employing diagrams that imitate those from early mechanological and physics textbooks. Detailed sectional numbering is employed and the practice documentation takes the form of a mechanical manual. Like Minsky's *The Society of Mind* the many sections refer back and forward, competing and contradicting, forming a series of junctures and should be considered a material component of the thesis' argument. Each of these sections can be examined in isolation but also rub up against each other creating new linkages. The thaumatropic discussed in [Chapter 3](#) approach is also continued throughout the thesis allowing binaries to flicker together. Thus impelled by the structure of the writing the types of breakdown and the adopted roles of the fiddler, symphorophilic, executioner and diagnostician are

at once motive forces and affected bodies; continually in motion; creative of and created by each other.

A degree of movement is also an important factor in my discussion of the machine in Chapter 1. Here I examined ways in which machines slip between classifications and came to a definition of the *breaking-machine* as a precarious and shifting form that exists on the verge of breakdown and in intimate relation with the artist/repairperson. Evoking Kurt Vonnegut's Tralfamadorian vision I examined the machine not as a fixed bounded body but as a transitory iteration of many states. Using the continual remaking of *Machine 26 (TheGodMachine)* as a guide I came to a definition of the machine that recruited Guattari's concept of the *ritornello*, Barad's *cut* and the *Gif* to describe a machine that is materialised temporarily at spatiotemporal junctures created by the signals of function and dysfunction.

Chapter 2 was written entirely in the presence of *Machine 16* and a gif-like fragment of Adorno's writing on gramophonic reproduction (Adorno, 2002: 275). Both of these *machines* played an active role in the thinking expressed through their ritornellos of function and breakdown. Initially the chapter employed a symptomatic approach, examining these machines to isolate four modes of breakdown: seize, play, burnout and cutting-loose. Ocular, auditory, haptic and olfactory symptoms were examined alongside their effects on the diagnostician. This investigation recognised that breakdown is not a simple process of cause and effect but rather an intricately interconnected linkage of evolving events. Using *Machine 28*, a machine that observes its own breakdown and repair, the chapter also examined the symptoms of breakdown as experienced by the machine. This led to a non-normative understanding of breakdown that escapes the expectations of function. In identifying four distinct types of breakdown the chapter went on to develop the differing ways in which these breakdowns signal within the machine and beyond. It concluded that the kinematic gestures of breakdown emits differing expanding and contracting forces around which bodies coalesce and disperse.

Chapter 3 applied the discoveries of the previous chapters to re-examine anthropomorphism and mechanomorphism. Rejecting the binary discussion of

anthropomorphism that dominates current discourse it sought an understanding of anthropomorphism that escaped the Vitruvian anthropocentric norm. To do this Chapter 3 employed a *thaumatropic* approach. Developed from the illusory flicker of one of my machines, it explored the coming together of machine and human in anthropomorphism via the creative blurring of opposites. This *thaumatropic* method is first developed via an examination of the “machine-replaces-man-replaces-machine trick” (Kane, 1971) in the construction of the Drones for *Silent Running* (1972). Using the *thaumatropic* flicker of the “making of” documentary and the feature film it developed an approach that focussed on breakdown as a moment of juncture. The importance of the “making of” form to my practice is highlighted throughout the chapter in the discussion of the unfulfilled artwork *Al*, and most crucially in the ongoing repair and reconfiguration of all of the machines of *Breakdown*. This examination produced an understanding that the ‘human’ and the ‘machine’ are co-creative; a process in which anthropomorphism and mechanomorphism are intimately involved. Throughout, Chapter 3 looked closely at the involvement of breakdown in the anthropomorphic process. Through an examination of my film *Deus*, the early Niagara barrel riders and the science fiction robot it revealed that forms of breakdown are junctures that can unbalance the Vitruvian model and lead to the dissipation and formation of bodies. Finally, Chapter 3 proposed a framework for this process of continual change, *Paramorphism*.

iii. Impact on my practice

The chief impact on my practice has been a shift in emphasis towards the performative. In examining the roles I assume in the making and presentation of my work this research has allowed me to develop the relationship between artist and technical art object as central rather than peripheral. This element has often been present in previous work, especially my *Automatic Films*, however it has never been fully articulated. The introduction to New Materialist theories, notably Karen Barad’s *Agential Realism* and Rosi Braidotti’s writing on the *Posthuman*, has given

me a framework for expressing a relationship between artist and technical art object that is not performance but is dependent on an ongoing interactive process. This has led me to develop a form of durational performative installation that accepts breakdown and change. In practical terms this has meant that audiences (and curators) are invited to question the technical art object's relationship to breakdown and to accept that various degrees of non-function are integral to or even necessary in its experience. As one visitor to *Love Machines* noted:

I visited the exhibition twice, both times briefly. On the first visit I watched a video of a straight-faced woman miming string tugging at various points on her face. The second time I went, the same screen was in standby mode as it hadn't been turned on correctly. Watching the little 'Cyclone' USB symbol dot this way and that, I couldn't decide whether or not it was intentional – whether it was irreverence or art.

(Balkan, 2017)

Breakdown in various forms has always been a central element of my practice, however, this research has led me to develop new more rigorous strategies for utilising and working with specific forms of breakdown. I have found 'Live' works such as *Machine 19* in which the visitor can interact with their flickering selfie particularly interesting in its ability to use breakdown to unbalance the viewer. This unstable post-Vitruvian position is one I want to explore further.

iv. Future post-doctoral study

Future post-doctoral study will focus on developing a deeper understanding of the many personas performed by both myself and visitors to the machines of *Breakdown*. As stated in section i, these personas appear to be in continual flux and new personas continue to appear. Two workshops held during *Love Machines* and *A Grand Exposition* (2017) allowed observations to be made of the personas adopted by children and parents as well as children with Asperger's. At the time these interactions did not fall within the scope of my research, however, I believe they

merit further investigation. Children, and those with Aspergers' to an even greater degree, displayed an intense interest in the tracing of forces through linkages. Drawn into the structure of the machine, they became visual and haptic *puzzlers*. In this role there was less interest in diagnosing fault than in the pleasure of following a mechanism. In interactions between parent and child during a machine-making workshop, apart from obvious parental didacticism, children became *users* deploying the parent as a tool-machine to complete tasks they deemed either too difficult or too boring. These personas as well as the performing *Fiddler* mentioned above i would form the basis of further research.



Pepper's Ghost Demonstration, Transition Gallery, 2017
photo by Joe Goodwin

Additionally the transience of roles that I am impelled to adopt could be examined further. In May 2017 I was asked to present a demonstration of the Victorian stage illusion "Pepper's Ghost"⁸² at an event hosted by Transition Gallery, London. During this symposium, which included academic papers and the presentation of artworks, I also acted as technician, supporting each of the speaker's technical

⁸² Pepper's Ghost is a proto-cinematic magic trick first presented by John Henry Pepper in 1862. With the use of controlled lighting and a sheet of glass positioned at 45 degrees to the audience a 'ghost' is brought onto the stage. This ghost is in fact an actor standing in the wings. The trick is still used today in conjunction with video projection most notably in 2012 to allow a live performance between musicians Snoop Dogg and Tupac Skakur several years after the death of the latter.

requirements. Just as in the exhibitions *Love Machines* and *Denis ex Machina* my role throughout the event was unfixed and even during my presentation I moved uncertainly between technician, researcher and hesitant showman.

In preparing for this demonstration I made some initial research into the parallels between the public experiments of scientists at London's Royal Institution and stage magicians of the early nineteenth century. Founded in 1799, the Royal Institution became famous for demonstrations by scientists such as Humphry Davy and Michael Faraday. These, often spectacular and dangerous, experiments were performed for the edification and amusement of a public that included Coleridge, and Wordsworth. At the same time, the most celebrated conjuror of the age, Joseph Pinetti, was calling himself *Professor of Natural Magic* and magician (and physicist) Étienne-Gaspard Robert was presenting his famous *Phantasmagoria* illusion to the *étonné* Parisian public. It is in this context of the slippage between science and magic that I wish to develop my post-doctoral study. Central to the performances of both the scientist and the magician is a relationship with apparatus and audience held together by flashes of amazement and the smell of dry ice.

BIBLIOGRAPHY

Adorno, T.W. (2002) *Essays on Music*, Berkeley, Los Angeles, London: University of California Press.

Aldiss, B. (1985) *Frankenstein Unbound*. London: Granada.

Aldiss, B (2011) *Greybeard*. London: Gollancz.

Angier, N. (2014). When Trilobites Ruled the World. *The New York Times*. [online] Available at: <https://www.nytimes.com/2014/03/04/science/when-trilobites-ruled-the-world.html> [Accessed 27 Aug. 2017].

Ariés, P. (1976). *Western attitudes toward death, from the Middle Ages to the present*. London: Marion Boyars.

Aristotle, (350BC) *Physics*, Bk2 pt4
<http://classics.mit.edu/Aristotle/physics.2.ii.html>

Armitage, J. (2011) *Virilio now: current perspectives in Virilio studies*. Cambridge: Polity.

Armitage, J. (2012) *Virilio and the media*. Cambridge: Polity.

Armitage, J. (2000) *Paul Virilio: from modernism to hypermodernism and beyond*. Thousand Oaks, California London: SAGE.

Asimov, I. (1950) *I, Robot*. UK: Harper Collins.

Atzori, P. and Woolford, K. (2017). *Extended-Body: Interview with Stelarc*. [online] Web.stanford.edu. Available at: http://web.stanford.edu/dept/HPS/stelarc/a29-extended_body.html [Accessed 16 Nov. 2017].

Babbage, C. (1832). *On The Economy of Machinery and Manufactures*. London: Charles Knight.

Badiou, A. (2005) *Being and event*. London: Continuum.

Ballard, J.G. (1968) *The Drowned World*. Harmondsworth: Penguin.

Ballard, J. (2014). *Concrete Island*. 5th ed. London: Fourth Estate.

Ballard, J.G. (2011) *Crash*. London: Harper Collins.

Banks, G. (1862). *Blondin: His Life and Performances*. 1st ed. London: Routledge.

Barad K. (2003) "Posthumanist Performativity: Toward an Understanding of How Matter Comes to Matter", *S I G N S*, Spring 2003 pp 801-831

Barad, K. (2007) *Meeting the universe halfway: quantum physics and the entanglement of matter and meaning*. Durham, N.C Chesham: Duke University Press Combined Academic [distributor].

Barthes, R., Miller, R. and Howard, R. (1976) *The pleasure of the text*. London: Jonathan Cape.

Bartlett, A. J. and Clemens, J. (2010) *Alain Badiou*. Durham: Acumen.

Bastien, P. (2017) *Pierre Bastien : Mecanoid* [online] Pierrebastien.com. Available at: <http://www.pierrebastien.com/en/press-mecanoid.html> [Accessed 17 Nov. 2017].

BBC News (2016) "Bin Laden Crash Pilot 'Suffering From Mental Overload' - BBC News". *BBC News*. Web. 7 Mar. 2017.

Bekoff, M. (2002) *Minding Animals*, Oxford: Oxford University Press

Benjamin, W., Zohn, H., Arendt, H. and Wieseltier, L. (2013). *Illuminations*. New York: Schocken Books.

Bennett, J. (2010) *Vibrant Matter: A Political Ecology of Things*. Durham: Duke University Press

Berardi Bifo, F., Stivale, C. and Mecchia, G. (2008). *Felix Guattari; Thought, friendship, and visionary cartography*. 1st ed. Basingstoke: Palgrave Macmillan.

Berger, J. (1999) *After the end: representations of post-apocalypse*. Minneapolis London: University of Minnesota Press.

Bergin, P. (1967). Andy Warhol: The Artist as Machine. *Art Journal*, 26(4), p.359.

Bergson, H. (1991) *Matter and Memory*, New York: Zone Books

Bindschedler, S., Cailleau, G. and Verrecchia, E. (2016). Role of Fungi in the Biomineralization of Calcite. *Minerals*, 6(2), p.41.

Bisson, T. (1991). *They're Made Out of Meat*. OMNI, (13:7), p.42.

Bitterli, K. (2014) *Roman Signer*. Köln: Walther König.

Boden, M. (2008). *Mind as machine*. Oxford: Clarendon Press.

Borst, A and Euler, T (2011). "Seeing Things in Motion: Models, Circuits, and Mechanisms". *Neuron*. **71.6**: 974–994

Bowman, M. (2017). East England Round-up. *Art Monthly*, (409), p.34.

Blake, C., Molloy, C. and Shakespeare, S. (2012). *Beyond human*. London: Continuum.

Braidotti, R. (2012). *Metamorphoses: Towards a Materialist Theory of Becoming*.

[ebook] Cambridge: Polity. Available at:

[https://books.google.co.uk/books?id=VZ8RAAAQBAJ&printsec=frontcover&dq=Metamorphoses:+Towards+a+Materialist+Theory+of+Becoming&hl=en&sa=X&ved=0ahUKEwi-6NC7mtrYAhWMD8AKHZuYDYcQ6AEILjAB#v=onepage&q=Metamorphoses%](https://books.google.co.uk/books?id=VZ8RAAAQBAJ&printsec=frontcover&dq=Metamorphoses:+Towards+a+Materialist+Theory+of+Becoming&hl=en&sa=X&ved=0ahUKEwi-6NC7mtrYAhWMD8AKHZuYDYcQ6AEILjAB#v=onepage&q=Metamorphoses%20Towards+a+Materialist+Theory+of+Becoming)

3A%20Towards%20a%20Materialist%20Theory%20of%20Becoming&f=false
[Accessed 15 Jan. 2018].

Braidotti, R. (2013), *The Posthuman*, Cambridge: Polity Press

Brassett, J. (2016), "Speculative machines and technical mentalities: a philosophical approach to designing the future", *Digital Creativity*, 27:2, 163-176,
<http://dx.doi.org/10.1080/14626268.2015.1102745>

Brett, G. (1968) *Kinetic art*. Studio Vista.

Brett, G., Cotter, S. and Douglas, C. (2000). *Force fields*. Manchester: Cornerhouse Publications.

Brillouin, L. (2004). *Science and information theory*. Mineola, N.Y.: Dover Publications.

British Pathé (2017). *Robot Art*. [video] Available at:
<https://www.britishpathe.com/video/robot-art/query/Tinguely> [Accessed 15 Nov. 2017].

Brockman, J. (2015). *What to Think About Machines That Think*. New York: HarperCollins Publishers Inc.

Broeckmann, A. (2017). *Machine art in the twentieth century*. Cambridge: MIT Press Lt.

Burghardt, G.M. (1991). "Cognitive ethology and critical anthropomorphism: A snake with two heads and hognose snakes that play dead". In Ristau, C.A. *Cognitive ethology: The minds of other animals*. Erlbaum. pp. 53–90

Capek, K. (2013) *RUR*. United Kingdom: Gateway.

Caporael L.R. (1986) *Anthropomorphism and Mechanomorphism: Two Faces of the Human Machine*

Castro, F. (1961). *Speech on the second anniversary of the triumph of the revolution.*

Chaisson, E. (1990). *Relatively Speaking*. New York: Norton.

Chondros, T., Milidonis, K., Vitzilaos, G., Vaitsis, J. (September 2013). "'Deus-Ex-Machina" reconstruction in the Athens theater of Dionysus". *Mechanism and Machine Theory* 67: 172–191.

Clarke A. C. (1968), *2001: A Space Odyssey*

Clarke, C. (2010). *Artists' Clinic*. Manchester.

Classics.mit.edu. (2017). *The Internet Classics Archive | Theseus by Plutarch*. [online] Available at: <http://classics.mit.edu/Plutarch/theseus.html> [Accessed 15 Mar. 2017].

Cleland, J. (2012). *Memoirs of Fanny Hill a New and Genuine Edition from the Original Text (London, 1749)*. Hamburg: Tredition.

Concept Lab and Flemming, P. (2012) *Critical Making*. Available at: <http://conceptlab.com/criticalmaking/PDFs/CriticalMaking2012Hertz-Projects-pp19to20-Flemming-MistakesAndAccidents.pdf> (Accessed: 8 November 2016).

Conley, V., Andermatt. (1993) *Rethinking Technologies*. University of Minnesota Press

Crocker, S. (2013) *Bergson and the Metaphysics of Media*, Palgrave Macmillan

CTheory (2010) *CTheory.Net*. Available at: <http://www.ctheory.net/articles.aspx?id=631> (Accessed: 8 November 2016).

Curtis, S. (2017). Robot Security Guard Commits Suicide. *The Mirror*. [online] Available at: <http://www.mirror.co.uk/tech/robot-security-guard-commits-suicide-10827936> [Accessed 9 Jan. 2018].

Dana, J. and Klein, C. (1855). *Manual of mineralogy*. New Haven: Durrie and Peck.

Debruge, P. (2017). *Is 'Elysium' Socialist Agitprop or Smart Sci-Fi Filmmaking?*. [online] Variety. Available at: <http://variety.com/2013/film/news/is-neill-blomkamp-elysium-socialist-propaganda-political-analysis-rearview-1200576930/> [Accessed 27 Jun. 2017].

Deleuze, G. and Patton, P. (1994). *Difference and repetition*. New York: Columbia University Press.

Deleuze, G. and Guattari, F. (1983). *Anti-Oedipus*. Minneapolis: University of Minnesota Press.

Deleuze, G., Tomlinson, H. and Galeta, R. (2001). *Cinema 2: The Time-Image*. Minneapolis: University of Minnesota Press.

Deleuze, G. and Howard, R. (1973) *Proust and signs*. London: Allen Lane.

Deleuze, G., Guattari, F. I. and Ddc. (2002) *A thousand plateaus: capitalism and schizophrenia*. London: Continuum.

Deleuze, G. (2004). *Desert islands and other texts, 1953-1974*. Los Angeles, CA: Semiotext(e).

Deleuze, G., Tomlinson, H. and Habberjam, B. (1986). *Cinema*. Minneapolis [Minn.]: University of Minnesota Press.

Derrida, J., (2008) *The Animal That Therefore I Am*, New York: Fordham University Press.

Dick, P. K. (2007) *Do androids dream of electric sheep?* London: Gollancz.

Dillon, S. (2012). *Ancient Greek portrait sculpture*. Cambridge: Cambridge University Press.

Dimitriu, A. (2017). *Normal Flora*. [online] Normalflora.co.uk. Available at: <http://www.normalflora.co.uk> [Accessed 19 Nov. 2017].

Dolphijn, R. and Tuin, I. v. d. (2012) *New materialism: interviews and cartographies*. Ann Arbor: Open Humanities.

Dovey, J. (2000). *Freakshow: First Person Media and Factual Television*. Edition. Pluto Press.

Duffy, B. (2003). Anthropomorphism and the social robot. *Robotics and Autonomous Systems*, 42(3-4), pp.177-190.

Eberle, S.G., (2014) “Elements of Play: Toward a Philosophy and Definition of Play”, *Journal of Play*, volume 6, number 2

Fawlty Towers, (1975). [TV programme] BBC 2: BBC.

Fink J. (2012) Anthropomorphism and Human Likeness in the Design of Robots and Human-Robot Interaction. In: Ge S.S., Khatib O., Cabibihan JJ., Simmons R., Williams MA. (eds) *Social Robotics*. ICSR 2012. Lecture Notes in Computer Science, vol 7621. Springer, Berlin, Heidelberg

Foster, H. (1996). Death in America. *October*, 75(Winter), pp.36-59.

Fuchs, C. (2016). *Reading Marx in the information age*. New York: Routledge.

Gallese, V. and Goldman, A. (1998). Mirror neurons and the simulation theory of mind-reading. *Trends in Cognitive Sciences*, 2(12), pp.493-501.

Garnet, H. (2012) *Critical Making*. Available at:

<http://conceptlab.com/criticalmaking/PDFs/CriticalMaking2012Hertz-Introduction-pp01to10-Hertz-MakingCriticalMaking.pdf> (Accessed: 8 November 2016).

Gazzola, V., Aziz-Zadeh, L. and Keysers, C. (2006). Empathy and the Somatotopic Auditory Mirror System in Humans. *Current Biology*, 16(18), pp.1824-1829.

Glenberg (2015). Big Myth or Major Miss?. *The American Journal of Psychology*, 128(4), p.533.

Goldsmiths. (2014). *Speculation and Speculative Research*. [ONLINE] Available at: <http://www.gold.ac.uk/unit-of-play/research/speculation>. [Accessed 2 November 2016].

Goldberg, K. (2001) *The robot in the garden: telerobotics and telepistemology in the age of the Internet*. Cambridge, Mass, London: MIT.

Gratton, P. (2014) *Speculative Realism – Problems and Prospects*, London: Bloomsbury

Greenfield, S. (2014) *Mind change: how digital technologies are leaving their mark on our brains*. London: Rider Books.

Greenland, C. (2013). *The Entropy Exhibition*. London: Routledge.

Griffiths, D. and Jordan, N. (2006) *StoryRooms: interactive networks, media art and installations*. Manchester: MMU.

Grundhauser, E. (2017). *Annie Edson Taylor's 1901 Retirement Plan: Go Over Niagara Falls in a Barrel*. [online] Atlas Obscura. Available at: <http://www.atlasobscura.com/articles/annie-edson-taylors-1901-retirement-plan-go-over-niagara-falls-in-a-barrel> [Accessed 23 Aug. 2017].

Grusin, R. (2015). *The Nonhuman Turn*. Minneapolis: University of Minnesota Press.

Guattari, F. and Lotringer, S. (2009). *Chaosophy*. Los Angeles, CA: Semiotext.

Guattari, F. (1995) *Chaosmosis, an ethico aesthetic paradigm*, Bloomington: Indiana University Press

Guattari, F. I. (2011) *The machinic unconscious: essays in schizoanalysis*. Cambridge, Mass London: Semiotext(e).

Guyton, Arthur C and John E Hall. *Textbook Of Medical Physiology*. Philadelphia: Elsevier Saunders, 2006. Print.

Haas, E., Christensen, T. and Haas, P. (2015). *Projecting politics*. London: Routledge.

Hampe, M., Renz, U. and Schnepf, R. (2011). *Spinoza's Ethics*. Leiden: Brill.

Haraway, D. J. (1991) *Simians, cyborgs and women: the reinvention of nature*. London: Free Association Books.

Haraway D. (1992) "The Promises of Monsters: A Regenerative Politics for Inappropriate/d Others" Grossberg, L., Nelson, C. Treichler, P. A. eds. *Cultural Studies* New York: Routledge pp295-337

Haraway D.(1994), "A Game of Cat's Cradle: Science Studies, Feminist Theory", *Configurations* Volume 2, Number 1, Winter 1994 pp. 59-71

Harman, G. (2009). *Prince of networks*. Melbourne: Re.press.

Hawking, S. (2008). *Into a Black Hole*. [online] Stephen Hawking. Available at: <http://www.hawking.org.uk/into-a-black-hole.html> [Accessed 19 Sep. 2017].

Hess, A. (2015). The Selfie Assemblage. *International Journal of Communication*, [online] 9, pp.1629–1646. Available at: <http://ijoc.org/index.php/ijoc/article/view/3147/1389> [Accessed 9 Aug. 2017].

Herbert, M. (2009). Trying to Cope with Things that aren't Human. *Art Monthly*, (326), pp.27-28.

Hines, P., Balasubramaniam, K. and Sanchez, E. (2009). Cascading failures in power grids. *IEEE Potentials*, 28(5), pp.24-30.

Horn, R. (1993) *Rebecca Horn*, New York: Guggenheim Museum

Horn, R. and Zweite, A. (2005). *Bodylandscapes*. London: South Bank Centre.

Hrala, J. (2016). *This Robot Keeps Trying to Escape a Lab in Russia*. [online] ScienceAlert. Available at: <https://www.sciencealert.com/the-same-robot-keeps-trying-to-escape-a-lab-in-russia-even-after-reprogramming> [Accessed 9 Jan. 2018].

Husbands, P., Holland, O. and Wheeler, M. (2008). *The mechanical mind in history*. Cambridge, Mass.: MIT Press.

Iacoboni, M. (2009). *Mirroring people*. New York: Farrar, Straus and Giroux.

Iliadis, A. (2015). Mechanology: Machine Typologies and the Birth of the Philosophy of Technology in France (1932-1958). *Systema*, 3(1), pp.131-144.

IMDb. (2017). *"Making Of" Titles (Sorted by Release Date, ascending)*. [online] Available at: http://www.imdb.com/search/keyword?keywords=making-of&mode=detail&page=1&ref_=kw_ref_key&sort=release_date,asc [Accessed 19 Oct. 2017].

Iverson, M ed. (2010), *Chance*, MIT Press, Cambridge Massachusetts

Johns, C. (2000). *Sex or Symbol?*. New York: Routledge.

Johnson G. A. ed., (1993) *The Merleau-Ponty Aesthetics Reader*, Illinois: Northwestern University Press

Joyce, J. (1922) *A Portrait of the Artist as a Young Man*, New York: B.W. Huebsch

Kahn, A. (2017). *Marvin Minsky, "father of artificial intelligence," dies at 88.* [online] MIT News. Available at: <http://news.mit.edu/2016/marvin-minsky-obituary-0125> [Accessed 15 Aug. 2017].

Kalush, W. and Sloman, L. (2007). *The secret life of Houdini*. London: Pocket Books.

Kauffman, S. (1995). *At Home in the Universe: The Search for Laws of Self-organization and Complexity*. Oxford University Press.

Kelly, C. (2009) *Cracked media: the sound of malfunction*. Cambridge, Mass: MIT Press.

Kennedy, J. S. (1992) *The New Anthropomorphism*. Cambridge: Cambridge University Press.

Keysers, C. (2011). *The Empathic Brain*. Lexington, Ky: Social Brain Press.

Kricke, N., Luginbühl, B., Tinguely, J. and Meyer, F. (1960). *Norbert Kricke, Bernhard Luginbühl, Jean Tinguely*. Bern: Kunsthalle.

Lafitte, J. (1932/1972). *Réflexions sur la science des machines*. Paris: Vrin

Landy, M., Sillars, L. and Tinguely, J. (2009) *Joyous machines: Michael Landy and Jean Tinguely*. London: Tate Publishing.

Latour, B. (1996). On Actor Network theory: a few Clarifications. *Soziale Welt*, [Online]. 47, 369-381. Available at: <http://www.jstor.org/stable/40878163?origin=JSTOR-pdf> [Accessed 3 January 2018].

Latour, B. (2007) *Reassembling the social: an introduction to actor-network-theory*.

Oxford: Oxford University Press.

Latour, B. (2007). "Can we Get our Materialism Back, Please?", *Isis*, 98(1): 138-142.

Le Feuvre L., ed. (2010) *Failure*. Cambridge, Massachusetts: MIT Press

Lemaignan, Fink & Dillenbourg, *The Dynamics of Anthropomorphism in Robotics*, 2014

Leslie, E. (2009). *Shudder - Shutter - Shatter*. [pdf] Animate Projects, pp.1-3.
Available at: http://www.animateprojects.org/writing/essay_archive/e_leslie_2
[Accessed 15 Dec. 2015].

Levin, T Y, 2002. *CTRL (Space): Rhetorics of Surveillance from Bentham to Big Brother*.
Massachussets: MIT.

Lobo, I. & Shaw, K. (2008) Discovery and types of genetic linkage. *Nature Education* 1(1):139

Locey, E. (2002) *The pleasures of the text: Violette Leduc and reader seduction*. United States: Rowman & Littlefield Publishers.

López, S. (2017). *Interview with Pierre Bastien*. [online] Rwm.macba.cat. Available at: http://rwm.macba.cat/uploads/songs/sonia115_20101202_96.mp3 [Accessed 18 Nov. 2017].

Lord, B. (2014) *Art & energy*. Washington, DC: The AAM Press.

Macfarlane, K. (2006). *Drawing links*. London: The Drawing Room.

Malabou, C. (2012). *The Ontology of the Accident: An Essay on Destructive Plasticity*. John Wiley & Sons.

- Malt, J., (2004) *Obscure Objects of Desire – Surrealism Fetishism and Politics*, Oxford University Press
- Mann, S. (2013). Veilance and reciprocal transparency: Surveillance versus sousveillance, AR glass, lifelogging, and wearable computing. *2013 IEEE*
- McFarland, D. (2017). *Guilty Robots, Happy Dogs: The Question of Alien Minds*. 1st ed. Oxford: Oxford University Press.
- McLuhan, M. (1994). *Understanding media*. Cambridge: The MIT Press.
- Menkman, R. (2011). *The glitch moment(um)*. Amsterdam: Institute of Network Cultures.
- Merleau-Ponty M. (2012) *Phenomenology of Perception*, London New York: Routledge
- Metzger, G. (1960). *Manifesto of Auto-Destructive Art*. [image] Available at: https://monoskop.org/Gustav_Metzger#mediaviewer/File:Metzger_Gustav_Manifesto_Auto-Destructive_Art_1960.jpg [Accessed 18 Nov. 2017].
- Michael, M., Costello, B., Mooney–Summers, J., (2015) “Manifesto On Art, Design and Social Science—Method as Speculative Event”, *Leonardo*, Vol. 48, No. 2, pp. 190–191, 2015.
- Mindat.org. (2017). *Calcite: Calcite mineral information and data..* [online] Available at: <https://www.mindat.org/min-859.html> [Accessed 27 Aug. 2017].
- Minden, M. and Bachmann, H. (eds.) (2002) *Fritz Lang’s ‘metropolis’: Cinematic visions of technology and fear*. Rochester, NY: Camden House.
- Minsky M. (1986) *The Society of Mind*, New York: Simon & Schuster

Minsky M. (2006) *The Emotion Machine: Commonsense Thinking, Artificial Intelligence, and the Future of the Human Mind*, New York: Simon & Schuster

Minsky, M. (2017). *Why I prefer science fiction to general literature*. [online] Webofstories.com. Available at: <https://www.webofstories.com/play/marvin.minsky/53;jsessionid=160DB15F6C2EE58F2631E94694580912> [Accessed 17 Aug. 2017].

Minsky, M. (2018). *Marvin Minsky's Home Page*. [online] Web.media.mit.edu. Available at: <https://web.media.mit.edu/~minsky/papers/option.chapters.txt> [Accessed 22 Jan. 2018].

Mitchell, M. (2011). *Complexity*. New York: Oxford University Press.

Molloy, C. (2006). *Discourses of Anthropomorphism*. Ph.D. Liverpool John Moores University.

Money, J. (1984). Paraphilias: phenomenology and classification. *American Journal of Psychotherapy*, 38(2), pp.164-178.

Monomaniafestival.co.uk. (2017). *monomania, one-day international arts festival, 8 march 2014, Cambridge, uk*. [online] Available at: <http://www.monomaniafestival.co.uk/#/main> [Accessed 21 Mar. 2017].

Mori, M., MacDorman, K. and Kageki, N. (2012). The Uncanny Valley [From the Field]. *IEEE Robotics & Automation Magazine*, 19(2), pp.98-100.

Murray, J. (1999). *Queen of the mist*. Boston: Beacon Press.

Museum Jean Tinguely (1996) *Jean Tinguely*, Basel

Natale, C. (2009). *Interaction control of robot manipulators*. Berlin: Springer.

Nechvatal, J. (2002) "Review of Paul Virilio's 'Ce qui arrive' / 'Unknown Quantity'" *Film-Philosophy Journal*, Vol. 6 No. 47, November 2002

Nicolosi, L., Harryman, E. and Kresheck, J. (2003) *Terminology of communication disorders: Speech, language, hearing*. 5th edn. Philadelphia, Pa. ;London: Lippincott Williams and Wilkins.

Olivier, B. (2016). Deleuze's "crystals of time", human subjectivity and social history. *Phronimon*, 17(1), pp.1-32.

O'Neill, J. (2003) *Five bodies: the human shape of modern society, New ed.* London: SAGE.

Palmer, W. (1993). *The films of the eighties*. Carbondale u.a.: Southern Illinois Univ. Press.

Parr, A. (2010). *The Deleuze dictionary*. Edinburgh: Edinburgh Univ. Press.

Parrika, J, (2012) *What is Media Archeology?* Cambridge: Polity Press.

Pathé (2017). *Robot Art*. [online] Britishpathe.com. Available at: <https://www.britishpathe.com/video/robot-art/query/tinguely> [Accessed 18 Oct. 2017].

Payne, J. (2018). *Fainting | Syncope Symptoms, Treatment and Causes*. [online] Patient.info. Available at: <https://patient.info/health/dizziness/fainting-collapse> [Accessed 16 May 2018].

Pearl, A. (2016). *What is it like to be a robot?*. [online] Fact.co.uk. Available at: <https://www.fact.co.uk/news-articles/2016/04/what-is-it-like-to-be-a-robot.aspx> [Accessed 19 May 2018].

di Pellegrino, G., Fadiga, L., Fogassi, L., Gallese, V. and Rizzolatti, G. (1992). Understanding motor events: a neurophysiological study. *Experimental Brain Research*, 91(1), pp.176-180.

Penrose, R. (2004) *The Road to Reality*, London: BCA.

Phillips, A. (2001). *Houdini's box*. London: Faber.

Pineda, J. (2010). *Mirror neuron systems*. New York: Springer.

Plato, Giovanni R. F Ferrari, and Tom Griffith. (2013) *The Republic*. 1st ed. Cambridge [u.a.]: Cambridge Univ. Press.

Popper, F. and Bann, S. (1968) *Origins and development of kinetic art*. London: Studio Vista.

Protevi, J. Patton, P. ed. (2003) *Between Derrida and Deleuze*, eds. London: Athlone Press.

Quality-one.com. (2018). *FMEA | Failure Mode and Effects Analysis | Quality-One*. [online] Available at: <https://quality-one.com/fmea/> [Accessed 22 Jan. 2018].

Randel, D. (1986). *The New Harvard Dictionary of Music*. London: The Belnap Press of Harvard University Press.

Ree, R. and Ratto, M.R. (2012) 'Materializing information: 3D printing and social change', *First Monday*, 17(7).

Rehm, R. (1992) *Greek Tragic Theatre*, London New York: Routledge

Reichardt, J. (1978) *Robots: fact, fiction and prediction*. London: Thames and Hudson.

Reuleaux, F. and Kennedy, A. (1896). *The Kinematics of Machinery: Outlines of a Theory of Machines*. 1st ed. London: MacMillan.

Richardson, K. (2015), *An Anthropology of Robots and AI: Annihilation Anxiety and Machines*, London, New York: Routledge

Russell, J. and Gablik, S. (1969). *Pop art redefined*. London: Thames & Hudson.

Rusu, B., (2010) Whitehead's "Concept of Speculative Philosophy- A Metatheoretical Perspective" *NOEMA* Vol. IX pp. 79-106

Sacks, O. (1996) *An anthropologist on Mars: seven paradoxical tales*. London: Picador.

Saint-Exupery, A (2000) *Wind, Sand and Stars*. London: Penguin.

Salter, C (2010), *Entangled: Technology and the Transformation of Performance*, Cambridge, London: The MIT Press

Satz, A. Wood, J. ed, (2009) *Articulate Objects: Voice, Sculpture and Performance*, Oxford, Berlin, New York: Peter Lang

Sauvagnargues, Anne. (2016) *Artmachines*. 1st ed. Edinburgh: Edinburgh University Press.

Shabana, A. (1996). *Theory of Vibration*. 2nd ed. New York, NY: Springer New York.

Schavemaker, M., Til, B., Wismer, B. and Cabañas, K. (2016). *Tinguely*. Köln: Verlag der Buchhandlung Walther König.

Schrodinger, E. (1944). *What is Life?*

Shaviro, S (2014) *The Universe of Things: On Speculative Realism*, University of Minnesota Press, Minneapolis

Sherman, S. (1996) 'New materialism.' *Metropolis U6* pp. 41-45.

Shimamura, A. (2013). *Psychocinematics*. Oxford: Oxford University Press.

Shove, E., Trentmann, F. and Wilk, R. (2009) *Time, consumption and everyday life: practice, materiality and culture*. Oxford: Berg.

Signer, D. & Zimmermann, P. ed. (2013) *Roman Signer / Talks and Conversations*, Cologne: König

Siebers, J. *The Method of Speculative Philosophy- An Essay on the Foundations of Whitehead's Metaphysics*, 2002, Kassel University Press

Simondon, G. (1958), *On the Mode of Existence of Technical Objects*, Paris: Aubier Editions Montaigne.

Sloterdijk, P. and Hoban, W., translator. (2013) *You must change your life: on anthropotechnics*. Cambridge: Polity Press.

Smith, M. (2005). *Stelarc: The Monograph (Electronic Culture: History, Theory & Practice)*. Cambridge, USA: MIT Press.

Sorensen, J. (1992). *The Andy Warhol Robot a "No Man" Show*. [video] Available at: <https://www.youtube.com/watch?v=he1XK7aQOrU> [Accessed 4 May 2017].

Stiegler, B. (2017). *Automatic Society: The Future of Work*. 1st ed. [ebook]

Cambridge: Polity. Available at:

https://books.google.co.uk/books?id=ofbvDQAAQBAJ&printsec=frontcover&dq=bernard+stiegler+automatic+society&hl=en&sa=X&ved=0ahUKEwjEkbrKm4_ZAhXlAMAKHSAzB-0Q6AEIJzAA#v=snippet&q=intensify%20exchange&f=false [Accessed 5 Feb. 2018].

Stengers, I. (2011), *Thinking with Whitehead*, Cambridge, London: Harvard University Press.

Stiles, K. & Selz, P. (2012) *Theories and Documents of Contemporary Art: A Sourcebook of Artists' Writings*, California: University of California Press

Stone, J. (2011), Functional neurological symptoms. *Journal of the Royal College of Physicians of Edinburgh*, 41(1), pp.38-42.

Suskind, P. (2007) *Perfume*. 1st ed. London: Penguin Books.

Tate.org.uk. (2017). *Nam June Paik: Section 7*. [online] Available at: <http://www.tate.org.uk/whats-on/exhibition/nam-june-paik/nam-june-paik-room-guide/nam-june-paik-section-7> [Accessed 7 Aug. 2017].

Tam, A. and Gordon, I. (2009). *Clarification of Failure Terminology by Examining a Generic Failure Development Process*. [pdf] International Journal of Engineering Business Management. Available at: <http://cdn.intechweb.org/pdfs/6304.pdf> [Accessed 22 Jan. 2018].

Teitelbaum, S. (2017). Scientists Say Asimov Put the Stars in Their Eyes. *LA Times*. [online] Available at: http://articles.latimes.com/1992-04-08/news/vw-636_1_foundation-trilogy-robot-stories-astounding-science-fiction [Accessed 15 Aug. 2017].

Telotte, J. P. (1999) *A distant technology: science fiction film and the machine age*. Hanover, N.H
London: Wesleyan University Press.

Telotte, J. P. and Ddc. (1995) *Replications: a robotic history of the science fiction film*. Urbana: University of Illinois Press.

Thacker, E. (2005). *FCJ-018 Living Dead Networks* | *The Fibreculture Journal* : 04. [online] Four.fibreculturejournal.org. Available at: <http://four.fibreculturejournal.org/fcj-018-living-dead-networks/>

The Making of Silent Running. (2002). [DVD] Directed by C. Barbee. Hollywood: Universal Studios Home Video.

The-page.org. (2017). *The Page / 'Enclosures', Canal, London.* [online] Available at: <http://the-page.org/enclosures-canal-london/> [Accessed 26 Jun. 2017].

The Perverts Guide to Cinema. (2009). [DVD] Directed by F. Sophie and S. Zizek. UK: Amoeba Film.

Third Rail Quarterly. (2015). *Bernard Stiegler on Automatic Society*. [online] Available at: http://thirdrailquarterly.org/wp-content/uploads/05_Stiegler_TTR5.pdf [Accessed 14 Mar. 2017].

Tinguely, J. (1960). *Homage to New York*. [image] Available at: http://moma.org/d/c/exhibition_catalogues/W1siZiIsIjMwMDMwNTIwOCJdLFsicCIIsImVuY292ZXIiLCJ3d3cubW9tYS5vcmcvY2FsZW5kYXIvZXhoaWJpdGlbnMvMzM2OSIsImh0dHA6Ly9tb21hLm9yZy9jYWxlbmRhci9leGhpYml0aW9ucy8zMzY5P2xvY2FsZT1kZSJdXQ.pdf?sha=6c8dafb08e422dad [Accessed 16 Nov. 2017].

Tinguely, J. and Beyeler, G. (1987) *Jean Tinguely*. Basel: Galerie Beyeler.

Tinguely, J., Sillars, L. and Landy, M. (2009) *Joyous machines: Michael Landy and Jean Tinguely*. London: Tate Publishing.

Toner, R (2016), *Ob_ject and Ob_serve: Avant-Garde Art* [online] http://www.fact.co.uk/news-articles/2016/03/ob_ject-and-ob_serve-avant-garde-art.aspx [Accessed 16th Nov. 2017]

Trentmann, F (2009) "Materiality in the future of history: things,

practices, and politics.” *Journal of British Studies* 48 (2), pp. 283-307

Tsai, L. (2001). *Mechanism design*. 1st ed. Boca Raton: CRC Press.

Turkle S, (2005) *The Second Self – Computers and The Human Spirit*, Cambridge, Massachusetts London, England: MIT press

Turner, M. and Kiernan, M. (2015). *Landmark papers in neurology*. New York: Oxford University Press.

Ure, A. (1935). *The Philosophy of Manufactures*. London: Charles Knight.

Van Der Tuin I. (2014) ‘Diffraction as a Methodology for Feminist Onto-Epistemology: On Encountering Chantal Chawaf and Posthuman Interpellation.’ *Parallax special issue ‘Diffracted Worlds - Diffractive Readings: Onto-Epistemologies and the Critical Humanities’* eds. Birgit M. Kaiser and Kathrin Thiele 20.3: 231-44.

Violand-Hobi, H. E. (1995) *Jean Tinguely: life and work*. Munich: Prestel.

Virilio, P. (1989) *War and cinema: the logistics of perception*. London: Verso.

Virilio, P. (2006) *Art and fear*. London, New York: Continuum.

Virilio, P. and Lotringer, S. (2008). *Pure war*. Los Angeles, CA: Semiotext(e).

Virilio, P., Institute. B. F (1994) *The vision machine*. Bloomington, Indiana London: Indiana University Press, British Film Institute.

Virilio, P. (2003) *Unknown quantity*. London: Thames & Hudson.

Vonnegut, J. (2000). *Slaughterhouse-Five*. 1st ed. London: Vintage Books.

Wexler, E. (1984). Andy's No-man Show. *Life*. [online] Available at: <http://cyberneticzoo.com/robots/1982-a2w2-the-andy-warhol-robot-lewis-allen-alvaro-villa-americancolumbian/> [Accessed 4 May 2018].

Whitehead A.N. (1978) *Process and Reality*, The Free Press, New York

Wilk, R. R., Shove, E. and Trentmann, F. (2009) *Time, consumption and everyday life: practice, materiality and culture*. Oxford
New York: Berg.

Wilson, A. (2008). Gustav Metzger's Auto-Destructive/Auto-Creative Art. *Third Text*, 22(2), pp.177-194.

Winerman, L. (2005) "The Mind's Mirror", *Monitor on Psychology*, October, Vol 36, No. 9, p.48

Wise, J. (2016). *Surveillance and film*. New York: Bloomsbury Academic.

Withers, R. and Zwirner, D. (2007). *Roman Signer*. Cologne: DuMont Buchverlag.

Wolf, R. (2011). A Homage to a Homage, Destruction at Its Core. *New York Times*. [online] Available at: <http://www.nytimes.com/2011/04/10/arts/design/swiss-institutes-destruction-pays-homage-to-jean-tinguely.html> [Accessed 16 Nov. 2017].

Wright, T. W. (1896), *Elements of Mechanics including kinematics, kinetics and statics*, New York: Drummond.

Zepke, S. (2015). *Art as abstract machine: ontology and aesthetics in Deleuze and Guattari*. New York [etc.]: Routledge.

APPENDICES

- i. Glossary
- ii. Breakdown Manual

GLOSSARY

Cam	<p>“A revolution is a struggle to the death between the future and the past” (Castro, 1961). A cam is a part fixed to a motor that translates a circular motion into a vectored motion. In machines powered by an electric motor the cam is the beginning of everything. Without a cam, an electric motor turns freely but without effect, it is only through the cam that the motor’s futile buzzing spin develops a gestural force that is expressed throughout the machine. The size of the cam dictates the magnitude of gesture produced, although this is also limited by the motor’s ability to turn the cam. A cam that is too large or heavy for the motor will lead to seizing in the mechanism overheating and even burnout. Similarly, if a cam is mounted off centre it may cause the motor to struggle through parts of its revolution leading to variations in speed of motion and degrees of “flamboyance” in its gestures. <i>Play</i> in a cam can lead to increasing <i>degrees of freedom</i> in a mechanism which in turn can lead to eccentricity, instability and failure.</p>
Degrees of Freedom	<p>In mechanical terms <i>degrees of freedom</i> refer to the number of modes a mechanism can move within. Thus, a hinge, for example, can be said to have one degree of freedom whereas a single robot arm consisting of ball and hinges joints is said to have six degrees of freedom (Natale, 2009: 1-10)</p>
Failure	<p>In engineering failure indicates total stoppage in a mechanism. A <i>Failure Mechanism</i> explains how a <i>failure event</i> occurs it is the path from cause to failure (Tam and</p>

Gordon, 2009). The failure mechanism under the banner of Failure Mode and Effect Analysis (FMEA) has been adopted by other sectors including business management and healthcare as a diagnostic tool and a method for prolonging function (Quality-one.com, 2018). FMEA is a causal mechanism that places emphasis on failure's preventability and impact on function and productivity.

Juncture

Unlike the junction the *juncture* is a spatiotemporal term, it denotes circumstance as well as location and is fixed in neither. A *juncture* slides. Juncture is a term appropriated from linguistics where it refers to the manner of moving or mode of relationship between two consecutive sounds. Junctures can include changes in pitch, volume and emphasis and are usually divided into three types. *Open junctures* occur at word boundaries, *closed junctures* refer to the changes between syllables and a *terminal juncture* is the diminishing volume at the end of a clause or sentence. Junctures are not experienced through written language but aurally. Different types of juncture can transmute the meanings of sequences of sound (Nicolosi, Harryman, and Kresheck, 2003: 166). They can cause slight changes, such as transforming a statement into a question or radical transformations between "I scream" and "Ice cream". Much like turning water into wine the juncture refers to an alchemical change, not an addition but a reordering. Thus the juncture is a moment when one thing slips into another but also crucially it is a point around which meaning turns. It does not create something new, the ingredients are the same "fork 'andles" become "four candles" without adding or taking away. The space in between becomes instrumental in the formation and dissolution of bodies. In terms of mechanical breakdown, the juncture is used to explore the sliding moments of change brought about by play, seize, burnout and cutting loose.

Where Merleau-Ponty asserts that the body materialises “between the see-er and the visible, between touching and touched” (Johnson ed., 1993: 126) one could say that it is the juncture’s betweenness that materialises and dissolves bodies.

Kinematics

Kinematics a branch of mechanics that deals with the motion of bodies and parts. It is derived from André Marie Ampere’s term *cinématique* from his *Essai sur La Philosophie des Sciences* (1834). Franz Reuleaux’s *The Kinematics of Machinery* (1876) placed kinematics at the centre of understanding of the machine presenting what he called an overarching theoretical understand of “the conditions which are common to all machines” (Reuleaux, 1876: 1). Reuleaux’s work attends to the detail of movement through a mechanism which he calls the *kinematic chain* (1876: vii) and for Reuleaux it is this kinesis that creates the machine: “A kinematic mechanism is moved if a mechanical force or effort be applied to one of its moveable links in such a way as to alter its position. The effort thus applied performs mechanical work which is accompanied by determinate motions; the whole, that is to say, is a **Machine**.” (1876: 50)

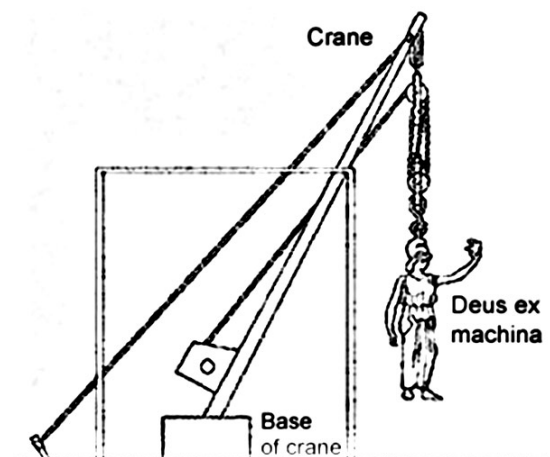
Linkage

Linkage is a term used in both mechanics and genetics and is used in this research to discuss the processes of transmission within and between humans and machines. In *The Kinematics of Machinery: Outlines of a Theory of Machines* (1896) Franz Reuleaux describes the *linkage* as a series of links joined together and transmitting forces along a kinematic chain. Central to Reuleaux’ definition is the idea of the “endless chain, consisting simply of single links connected together” (Reuleaux, 1896: 46). Reuleaux’ move from simple links to complex systems suggest that *linkage* can be described as form of mechanical emergence an idea picked up by Marvin

Minsky in his theories on AI in *Society of Mind* (1985). In genetics the term is used slightly differently, here it defines the likelihood that pairs of genetic markers are inherited together during meiosis in sexual reproduction (Lobo & Shaw, 2008: 139). By combining the genetic and the mechanical definitions of linkage it is possible to understand it as transmitting, connecting and generative.

Mechane

In seeking for an ancestor for the machines of *Breakdown* and one that specifically explores anthropomorphism I have examined the Ancient Greek crane the *Mechane*. This machine formed a part of the theatrical apparatus The *Deus ex Machina*⁸³, first used by Aeschylus and Euripides (Rehm, 1992: 68-73) to fly a god onto stage. (Rehm, 1992: 70). Deployed to dig the story out of a plot hole, The *Deus ex Machina* made a conscious break in the narrative and, to create a god, a theatrical cyborg was enacted. This human-*Mechane* cyborg both creates and breaks illusion; it lays bare the mechanics of godhood and reveals a phenomenon of human-machine *intra-action*. Using the *Mechane* as an ur-



⁸³ Chondros, Thomas G.; Milidonis, Kypros; Vitzilaios, George; Vaitsis, John (September 2013). ""Deus-Ex-Machina" reconstruction in the Athens theater of Dionysus". *Mechanism and Machine Theory* 67: 172–191. This article describes a reconstruction of a Deus Ex Machina from archaeological and literary evidence.

machine I explore anthropomorphism with the understanding that, in the case of the *Deus ex Machina*, it is not clear where the boundaries of: the machine, the human or the god, begin or end.

Negentropy

In his 1944 lecture *What is Life?* Erwin Schrodinger posited that life “feeds upon negative entropy... continually sucking orderliness from its environment” before going on to define what he denoted -entropy as a measure of order (Schrodinger, 1944). The idea was picked up by physicist Léon Brillouin who in *Science and Information Theory* (1956) coined the term *negentropy* and went on to correlate it with information (Brillouin, 2004: 152-9). In 1958 Gilbert Simondon also used the term negentropy to describe the stabilising effects of machines (Simondon, 1958: 9). Bernard Stiegler brings sucking life, ordering information and stabilising machines together in his recent book *Automatic Society* (2017) in which he defines negentropic forces as vital in the fight against the entropic Anthropocene (Stiegler, 2017).

Paramorphism

Over the last 541 million years, seas of calcite and aragonite have flipped between their two states. It is an aeonic flicker working at a frequency of at least 10000000 years and brought about by large scale changes in environmental temperature and pressure. Both calcite and aragonite are crystalline compounds of calcium carbonate, they have identical chemical compositions but entirely different structures. Both minerals have also had an intimate relationship with organic life; forming shells, the cathedral like constructions of micro-organisms (Bindschedler, Cailleau

and Verrecchia, 2016) and even lenses in the compound eyes of trilobites (Angier, 2014). Calcite, especially has many forms with fanciful names: Angel Wings, Dog-tooth Spar, Barleycorn and Stinkkalk⁸⁴. The very mutability of calcite and aragonite and their multiple interactions with the crumbling gumminess of organic life makes them an interesting model for understanding the role of events such as breakdown in restructuring relationships. The incredible slowness of paramorphic restructuring, around say environmental change or interaction with the cells of a trilobite when apprehended alongside the flickering of a tv screen, reveals a moment of convergence when everything and nothing changes.

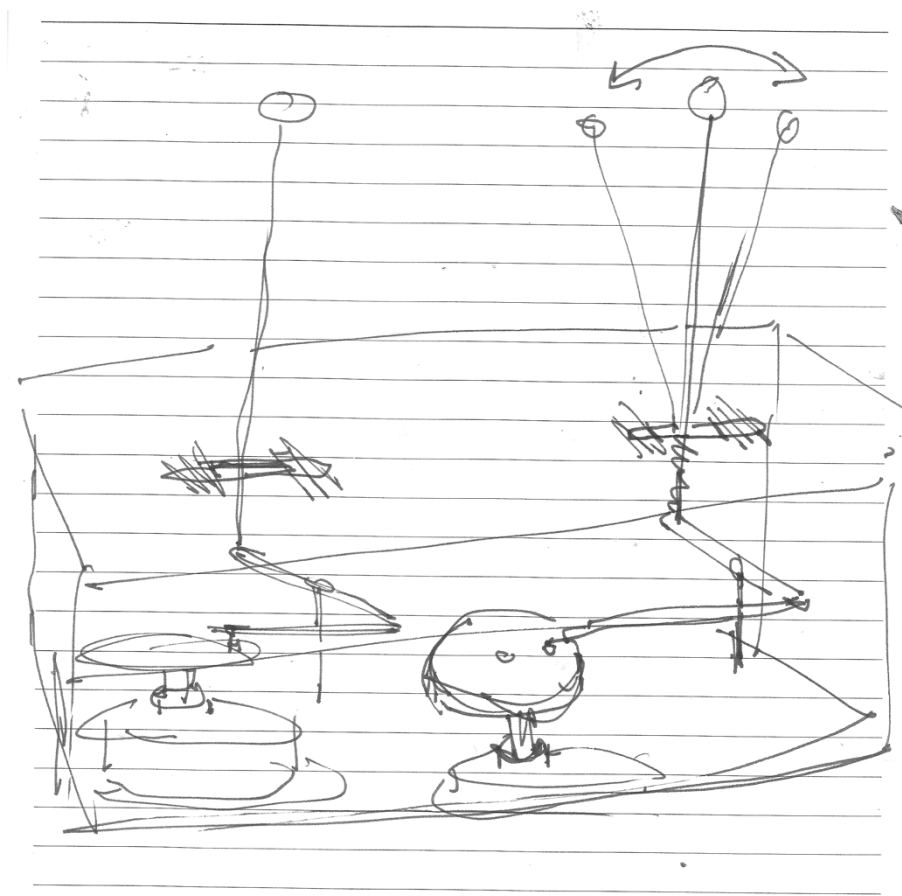
Prismatic joint	This provides a linear sliding movement between two bodies, and is often called a slider, as in the slider-crank linkage. In the machines of Breakdown prismatic joints are the main method used for translating the circular movement of an electric motor into linear movements.
Revolute joint	Also called pin joint or hinge joint allows movement around a single point in just one plane. Examples of revolute joints include door hinges, clock hands and door handles. A revolute joint has one degree of freedom unless affected by a form of breakdown such as <i>play</i> .
Robopsychology	Developed by Dr Susan Calvin, the central character of Isaac Asimov's <i>I Robot</i> (1950), robopsychology is a method for understanding breakdown in the positronic (robotic) brain. Its methods combine a mixture of mathematical logic and human psychology (Asimov, 1950: 110-136). Two unpublished

⁸⁴ Stinkkalk is termed for the noxious odour it releases when broken (Mindat.org, 2017)

chapters of Harry Harrison and Marvin Minsky's *The Turing Option* reveal that Minsky (Co-founder of MIT's AI lab) was planning to write a book entitled "robopsychology" (Minsky, 2018). As such robopsychology represents a cyborg joining of human-machine, fact-fiction binaries.

BREAKDOWN MANUAL

The Breakdown Manual contains descriptions of the machines made for *Breakdown* and the two solo shows in which the works were presented; *Denis ex Machina* and *Love Machines*. In each case in keeping with the methodology laid out in the main text the machines have been presented in terms of their mechanical makeup, function and breakdown. They are each accompanied by images and links to video documents. The pieces discussed here have been titled *Machine* and numbered to concentrate on their status as mechanical devices. Some machines are missing (notably 1, 3, 4 & 5) and *Machine 10* has been redacted as I deemed the use of some of its components to be unethical. In *Posthumanist Performativity: Toward an Understanding of How Matter Comes to Matter* Barad states that matter carries with it an on-going historicity (Barad, 2003: 823). In keeping with this assumption, the reader will note that many of the machines listed here re-use the parts of earlier models.



Machine 2



Machine 2 (2015)

Appearances:

Gallery 333, Phoenix Arts Centre, Exeter, 2016

Materials:

Windscreen wiper: Found in the gutter, the windscreen wiper represents an upgrade from *Machine 2*'s original wooden arm. Having pre-drilled holes, it was much easier to dismantle for transport to Exeter.

Surgical tape: I had broken my toe only a few weeks earlier and this leftover padded tape was lying around my studio. It is strong and highly adhesive but has a degree of give in it. In the context of a machine it introduces play into the mechanism.

Clip on bells: These were found objects probably originally intended to be clipped to a pram. Although a little rusty, having spent at least three years buried in a garden, they still jingled. They were attached to the machine as a counter-weight for the wiper. The bells improved its swing and made the camera tap on the glass a little more insistently.

Packing tape: This tape has "fragile" printed on it. It is usually used for wrapping sculptures. It was within reach at a vital moment. The tape is both a physically protective device and a warning of fragility.

Camera: Shipped from Hong Kong this is a simple digital camera that focuses light on a grid of sensors. It is tapped against the glass once every 20 seconds by the arm mechanism. The image it produces is soft and tinged with green. As it repeatedly hits the glass there are small interferences in the image it transmits to the screen hung on the wall behind it. This image is inverted and, as the camera moves, it swings in and out of focus. Opposite the machine are a pair of glass automatic doors which open for people to enter the gallery. There is an unintended interaction between the two machines.

Wood: Crudely formed with a coping saw to form a base and a cam. The cam is not smoothly cut leading to a juddering motion. There is nothing *true* about the construction; joints are loose leading to a great deal of *play* in the workings. This makes the movement of the camera extremely eccentric, tentative even.

Dansette legs: Taken from a piece of bedroom furniture. The legs can be unscrewed for transport.

Cotton reel: This is a part of the cam linkage. It is secured with a screw that occasionally slips out.

Motor: This is a mirror-ball motor, it turns at a rate of one revolution every twenty seconds. If over stressed it will grind and can reverse direction. Over time the plastic cogs will lose their teeth, the motor will skip and eventually lose all motion besides a slight judder.

Breakdowns Exhibited:

The attachment of the cotton reel is the most common breakdown site. Its screw occasionally works loose causing the cam mechanism to *cut-loose*. The result of this breakdown is that the camera stops tapping on the glass and merely twitches.

Links:

<https://www.instagram.com/p/2gwtSjBPNA/?taken-by=rotagavinii>

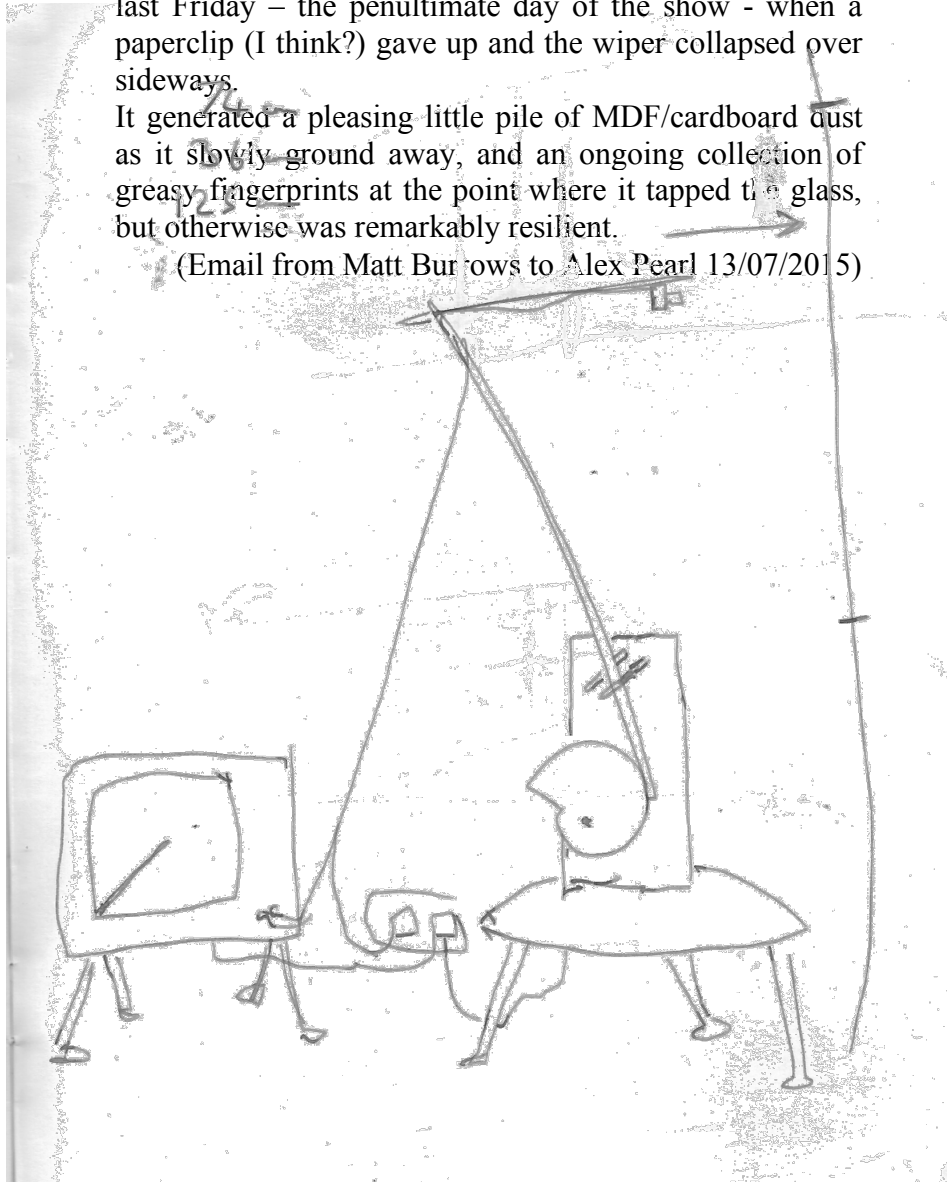
Additional Information:

Built to tap on the glass and watch passers-by in the Phoenix Arts Centre, Exeter, *Machine 2* displayed many idiosyncrasies in its mechanism. In the month it was on display its tap became weaker, the whole machine changed position and small amounts of residue were deposited in the vitrine that encased it. This gradual breakdown was mechanically encoded by its materials. For example, the surgical tape with its cushioning properties allowed increasing amounts of play (the space in or through which a mechanism can or does move) in the arm mechanism. The clip-on bells fell off resulting in a gentler swing of the windscreen wiper and, at the end, a small fixing worked loose.

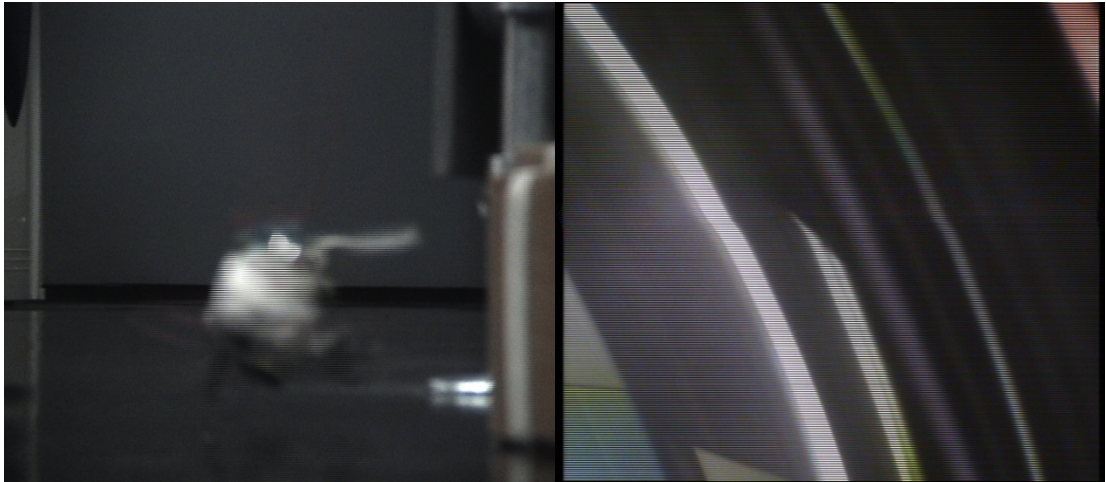
I am happy to report that Machine no.2 performed admirably, coincidentally only giving up the ghost just last Friday – the penultimate day of the show - when a paperclip (I think?) gave up and the wiper collapsed over sideways.

It generated a pleasing little pile of MDF/cardboard dust as it slowly ground away, and an ongoing collection of greasy fingerprints at the point where it tapped the glass, but otherwise was remarkably resilient.

(Email from Matt Burrows to Alex Pearl 13/07/2015)



Machine 6



Appearances:

FACTlab, FACT, Liverpool, 2015

Compression Culture, Manchester Metropolitan University, 2015

Materials:

Thread, motor, camera.

Breakdowns Exhibited:

The motor became tangled in the thread leading to a seize.

Repairs:

See below

Links:

<https://vimeo.com/142115802>

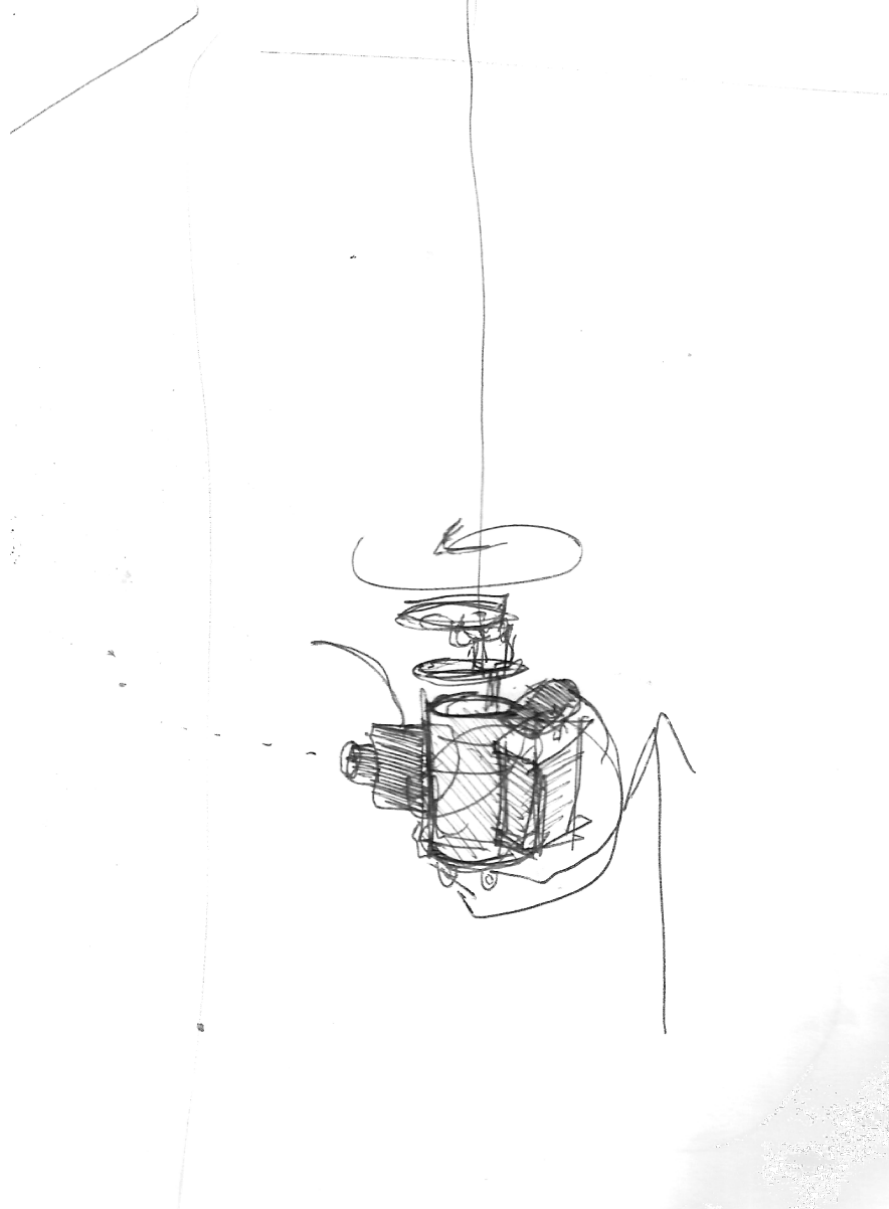
<https://vimeo.com/142115803>

<https://vimeo.com/142115804>

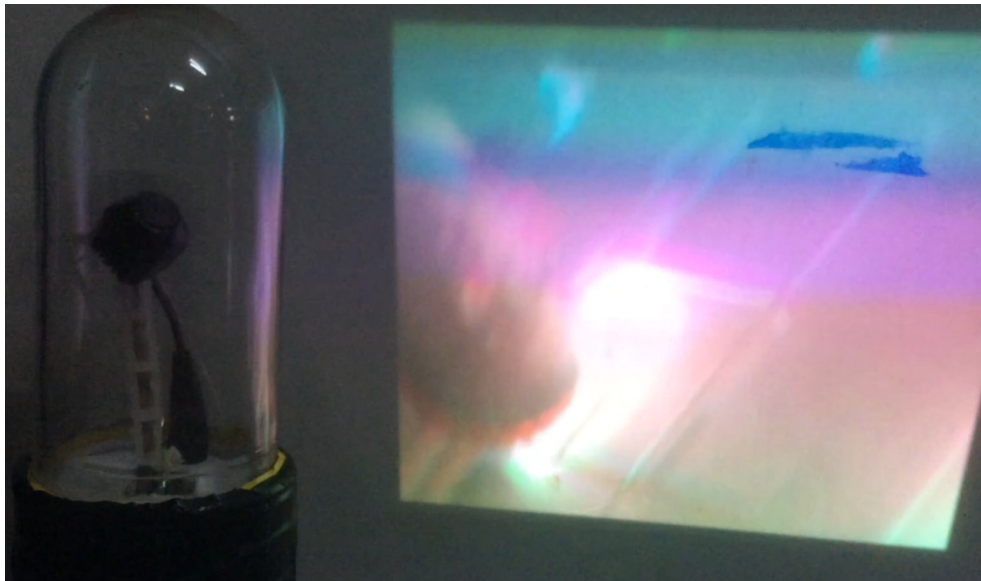
Additional Information:

Machine 6 features, and is made by, a simple machine that spins itself to breakdown. This is usually caused by entanglement with the thread from which it hangs, battery failure or impact trauma. The video produced by the machine

resonates with a scene in Powell and Pressburger's film *The Red Shoes* (1948). As the dancer spins we presented with her viewpoint, the theatre lights whirling past. Martin Scorsese uses the same shot in *Raging Bull*, (1980). In both cases, it is a moment in which the audience is persuaded that they have entered the bodies of the superhuman character (film star, boxer, ballerina). In fact, they have entered the body of the machine. *Machine 6* is an assemblage of machine-camera-video recording and human action. This *video-machine* captures moment of set up and activation by human hand. The artist is involved in a process of looking, crouching and touching with the machine.



Machine 7



Appearances:

FACTlab, FACT, Liverpool, 2016

Materials:

Camera, glass dome, cardboard, projector, variable transformer, toy mechanism.

Breakdowns Exhibited:

The machine is powered through a transformer turned so low that it hovers at the point of breakdown much like Rossetti's, *Beata Beatrix* (1864) it is an *approaching-breakdown-machine*. There is also a breakdown of interference between the camera and the projector this is caused by the environment of the machine, humidity and the proximity of bodies including its own electric motor.

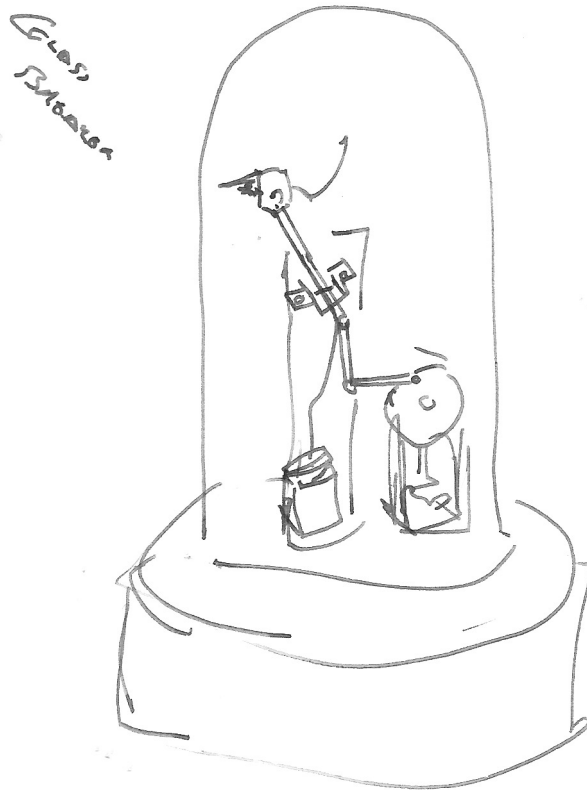
Repairs:

Machine 7 uses a toy mechanism to repeatedly tap a camera on the glass of an enclosing dome, it is an upgrade of *Machine 2*. Obsolescence and replacement is one of the features of machine life but in a sense *Machine 2* continues through *Machine 7*. In their relationship with the artist and each other they have become autopoietic and part of a hereditary system.⁸⁵

⁸⁵ See Guattari for an extension of this theme in his essay *Machinic Heterogenesis* (Conley ed, 1993: 13-27)

Links:

<https://vimeo.com/153370869>



Machine 8

Appearances:

FACTlab, FACT, Liverpool, 2016

Materials:

Cardboard box, dansette leg, stepped motor, electronics, motion sensor, camera, dowel, tape



Breakdowns Exhibited:

This autonomous machine houses sensors and motors that affect a rather elegant dance whenever a change in light is detected. The seeming randomness of its movements are enacted by a combination of play and seizures in its mechanism.

Machine 8 also interacts with the floor in producing a changing symphony of creaks and squeaks as it navigates the space.



Repairs:

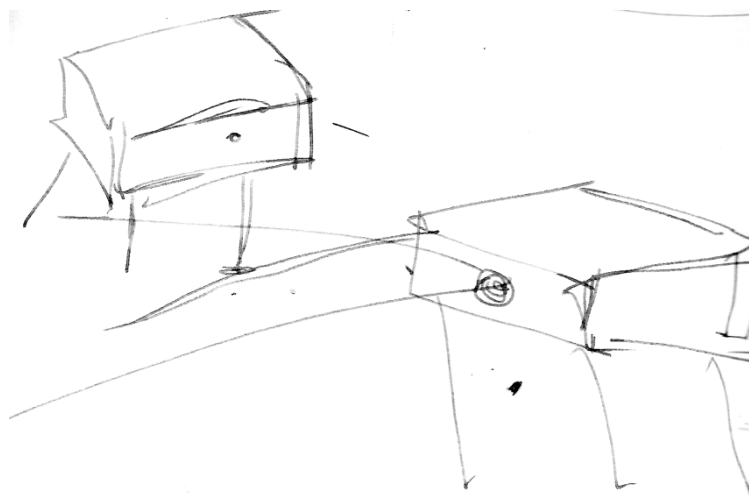
Machine 8 has undergone a range of repairs and upgrades over time. These have included a camera that gives a live machine-eye view of its actions as well as a bright livery that was necessary to pass FACT's health and safety requirements.

Links:

<https://vimeo.com/142540310>

Additional Information:

In *The Reproductive System* (1968), John Sladek presents a farcical novel made up of a huge array of parts, both human and machine, which grind together as they head towards mutual destruction. The eponymous protagonist is an endlessly replicating artificial intelligence made up of varying sized metal boxes. Each box deploys tools and sensors from its otherwise inscrutable body as need arises.



Machine 9, Sound Activated Machine

Appearances:

FACTlab, FACT, 2015-6
Compression Culture,
 Vertical Gallery,
 Manchester School of
 Art, 2015



Materials:

Machine 9 consisted of
 of a simple cmos camera
 attached to circuit board from a toy and a monitor. The camera only powered up in
 response to the sound of the echoing space of the Vertical Gallery.

Breakdowns Exhibited:

Once activated, because of its fluctuating power levels, it was never able to function fully as a camera-monitor assemblage should. It presented images that varied between incomprehensible static to glimpses of the building and its residents. As such it was a phenomenon brought about by the interactions of architectural space, human presence, the timetable of the institution and the machine

Repairs:

No running repairs were required; however, *Machine 9* has since been broken down and remade to form *Machine 19*.

Links:

<https://vimeo.com/142504661>

Machine 10 (REDACTED FOR ETHICAL REASONS)



Response	Percentage
Yes, the current administration is responsible	85%
No, the current administration is not responsible	15%

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

Machine 11 - Porcelain Machine



Appearances:

*Vessels with Pestles and Chalice*s from Palaces, Minorities Galleries, Colchester, 2016

Materials:

This machine is a collection of hand-made porcelain levers, spindles and cams powered by an electric mirror ball motor.

Breakdowns Exhibited:

Machine 11 is a *video-machine*, a looped record of a functioning ceramic machine. The machine is dry, there is too much *play* in the mechanism and the parts are rough and warped. These built-in imperfections cause the machine to *seize*, grind and jam, the levers jump and occasionally *cut-loose*. Its struggle with function is expressed through sound produced by the grinding of parts, the catching of imperfections, the strain of the motor. The machine continues to function but it functions differently. Breakdown is both integral to this function and embodied in the materials and the process of its construction, it is no accident.

Repairs:

Continual fiddling and adjustment is required to keep this machine functioning for more than a few minutes at a time.

Links:

<https://vimeo.com/147958446>

Machines 12 & 13

Appearances:

OB_JECT & OB_SERVE, A Small View Gallery, Liverpool, 2016

Our Friends Electric, Quad, Derby, 2017

Materials:

Single channel video, toy mechanisms, string, plastic tube.



Breakdowns Exhibited:

This machine functions through its breakdown. The elements making it up show aspects of the emergent behaviour suggested by Marvin Minsky's concept of the mind as a community of competing agents.



Installation shot, QUAD, Derby

Repairs:

None

Links:

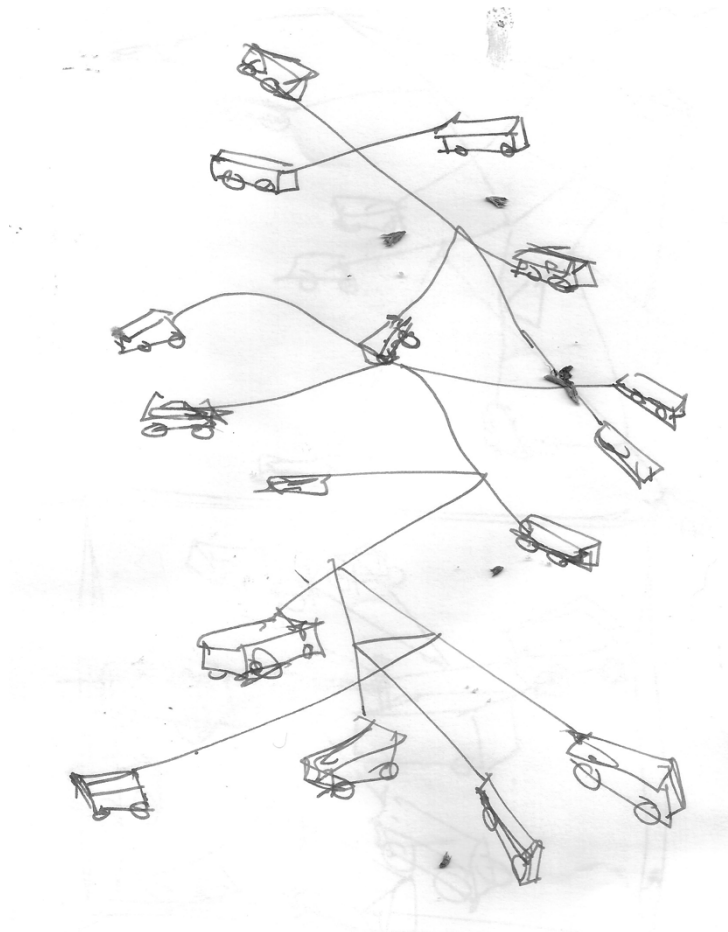
http://digicult.it/sound/factlab-and-the-object-liberation-front-present-object-and-ob_serve/

<https://vimeo.com/152286237>

<https://vimeo.com/152155997>

Additional Information:

This *video-machine* is, machinic as it is made through the interaction of smaller machines that interrupt each other's flow. It was made while trying to learn Cat's Cradle for a new *Reading and Thinging* group at FACTlab. As my arthritic thumbs were shouting at me, I toyed with the idea of coming up with a sort of cat's cradle machine. But this was a far too complicated process.



Machine 14

Appearances:

*Observe &
Object*, A Small
View Gallery,
Liverpool, 2016

Materials:

Electric earwax
remover, lamp,
electronics, tables



Breakdowns Exhibited:

Machine 14 teeters on the brink. Under the light, it twitches very slightly with each inhalation of air. The air is drawn in by a simple pulsing fan mechanism that is in turn activated by a small board of electronics attached to a phone charger. The electronic board is damaged and no longer functions as it once did. Now it can only emit a small charge of electricity at regular intervals.

Repairs:

None

Additional Information:

Machine 14 shamelessly deploys its anthropomorphic devices. The foetal shape of the earwax remover with its steady, but faint, heartbeat is 'watched' by the tenderly curving lamp. Humans easily understand these patterns produced by the anthropomorphic screen as they have been repeatedly deployed throughout our childhoods. There are all too obvious echoes here of Pixar animations, brave toasters and feisty cars called Herbie.



Visitors to the opening of the exhibition undoubtedly gathered round the stricken object in response to its anthropomorphic call but also, perhaps, for other reasons. In the context of the show *Machine 14* lay on two sub-domestically scaled tables. To the left were works by Thiago Hersan and Radames Anja. Mobile phones with robotic prostheses were 'intelligently' trying to take selfies. One wiggled, danced and shivered in front of a mirror as it sought to recognise itself and post the resulting image online. In the circle surrounding *Machine 14* the question came: "what does it do?"

Machine 14 barely does anything. A broken circuit board periodically allows a tiny pulse of electricity to enter the Earwax remover. This causes a barely audible ticking, the occasional almost imperceptible twitch and a tiny intake of air. At the crowded private view only the twitch was caught by observers. It isn't quite a machine freed from production but its apparent breakdown drew concern and interest from the audience that was distinct from its anthropomorphic call.

Alex Pearl's *Simple Machines* simplifies objects, right down to their raw state... after we dispose of them! Provocatively, he's clubbed old items together to try and make sense of their new state, and asking; are they still serving a function? At first glance perhaps they are not, but put your ear a little closer to *Machine 14* and an old battery powered ear wax remover may be humming a new, nostalgic tune. Old objects get rusty, but they're not

yet dead. Perhaps what we come to consider superfluous may be useful... just these few objects probe a multitude of questions, and ambiguity makes simplicity quite remarkable.

(Rachel Toner, 2016)

Machine 15

Appearances:

Home Time, Transition Gallery, London,
2016

Materials:

Found suitcase, orange, Fisher Price
nursery rhyme tv, dansette legs.



Breakdowns Exhibited:

Just before its exhibition, the mechanism designed to scroll a stained piece of paper across the tv screen fell apart. After several frenzied minutes, I managed to move it completely beyond repair and had to settle for the sound of its damaged music box.

Repairs:

See above

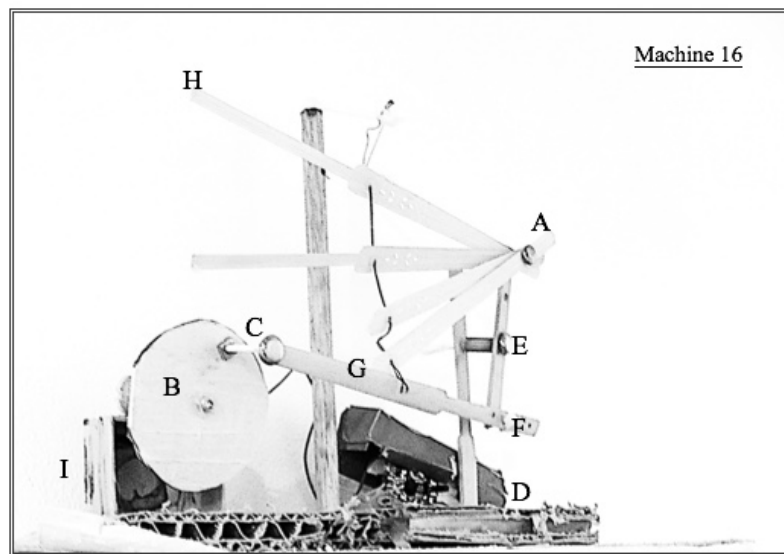
Links:

https://www.instagram.com/p/_Hdn8UBPC1/

Additional Information:

This simple machine is powered by clockwork and must be wound by a human participant. Once activated it produces a sound altered via breakdown. The sound is produced by a small music box that functions by the rotation of a toothed barrel catching a comb of metal tines. These tines have been loosened and bent. The breakdown causes notes (of the original tune) to be missed and distorted. The resulting melody seems halting and melancholic. Much like Catharine Malabou's concept of destructive plasticity (Malabou, 2012: 18) there is a sense that through breakdown a new object has been enacted.

Machine 16



Appearances:

Flat-Out Lowlanders, Blackwater Polytechnic, 2016

Denis ex Machina, CANAL Gallery, London, 2016 (solo)

Love Machines, Minorities Galleries, Colchester, 2017 (solo)

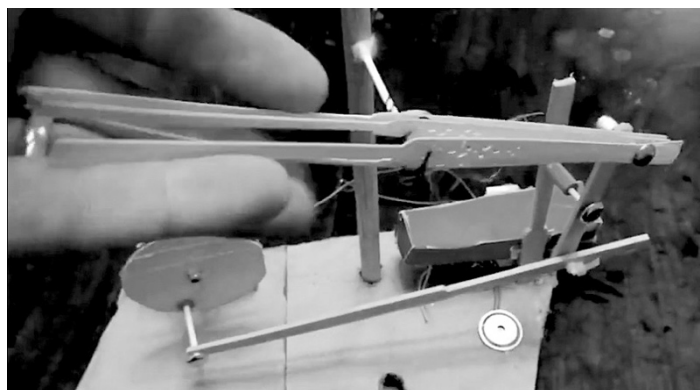
A Grand Exposition, Talbot Mill, Manchester, 2017

Materials:

Cardboard, dowel, fan struts, plywood, sound sensor, motor, pins, thread.

Breakdowns Exhibited:

Play: Looseness in the revolute joints (A, C, E, F) and deformation of the camshaft (B) Leads to significant lateral movement throughout the linkage.



Seize: Largely caused by the play exhibited above the seizes include temporary jams in the mechanism and ones that call for haptic response.

Repairs:

While on show at Blackwater Polytechnic, the machine left its shelf due to the vibration of function. The motor cut loose from the main body of the machine and it was found twitching on the floor.

During exhibition as part of *Love Machines*, *Machine 16* was connected to the floor by an aluminium pole. Over time the joint between cardboard and aluminium weakened causing the machine to cant over and the mechanism to tangle. A repair was made with yellow electrical tape and a map pin.



Links:

A video machine showing a haptic response to breakdown in *Machine 16*

<https://vimeo.com/167866885>

Additional Information:

Machine 16 is central to the discussion in Chapter 2 and was key in identifying different types of breakdowns and their characteristics.

Machine 17

Appearances:

Love Machines, Minorities
Gallery, Colchester, 2017

Materials:

Coloured Perspex, casters, toy
mechanism, 2 x Sound
sensors, light sensor, dowel,
plastic lid, screws, meccano.

Breakdowns Exhibited:

Cutting loose: Machine 17 has
been discovered on several
occasions having discarded its
outrigger wheel and its
primary propulsion unit
(plastic lid) in these cases it



had fallen on its side and was unable to move. It is suspected that some of these incidents were caused by over-zealous human investigation or attempts to 'rescue' the machine when it had wedged itself in a corner. More than once *Machine 17* was involved in collisions with other machines.

Repairs:

More reassembly than repair these usually
consisted of pushing parts back into place.

Additional Information:

Machine 17 is essentially a remake of
Machine 8, using many of the same parts
and the same locomotive principles.



Machine 18 (Mechane)

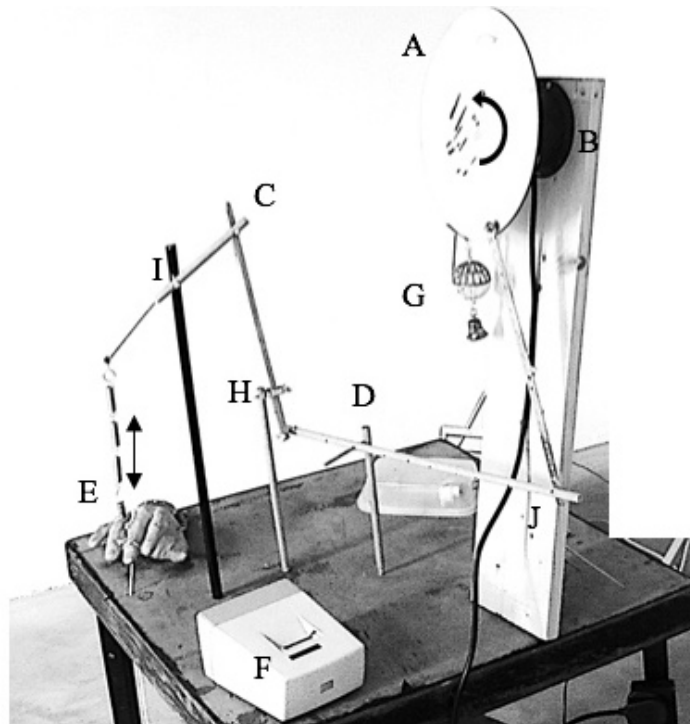
Appearances:

Love Machines, Minorities

Gallery, Colchester, 2017

Materials:

Cmos camera, TV,
plywood, dowel, latex
hand, motor, slide viewer,
knitting needle, springs,
budgie toy.



Breakdowns Exhibited:

Seize, especially in revolute joint D, a breakdown which exhibits auditory symptoms and is involved in the jerky movements at E and A

Repairs:

Revolute joint D works loose after about a month of function leading to more degrees of freedom in the linkage and less pronounced movement in the latex hand E

Links:

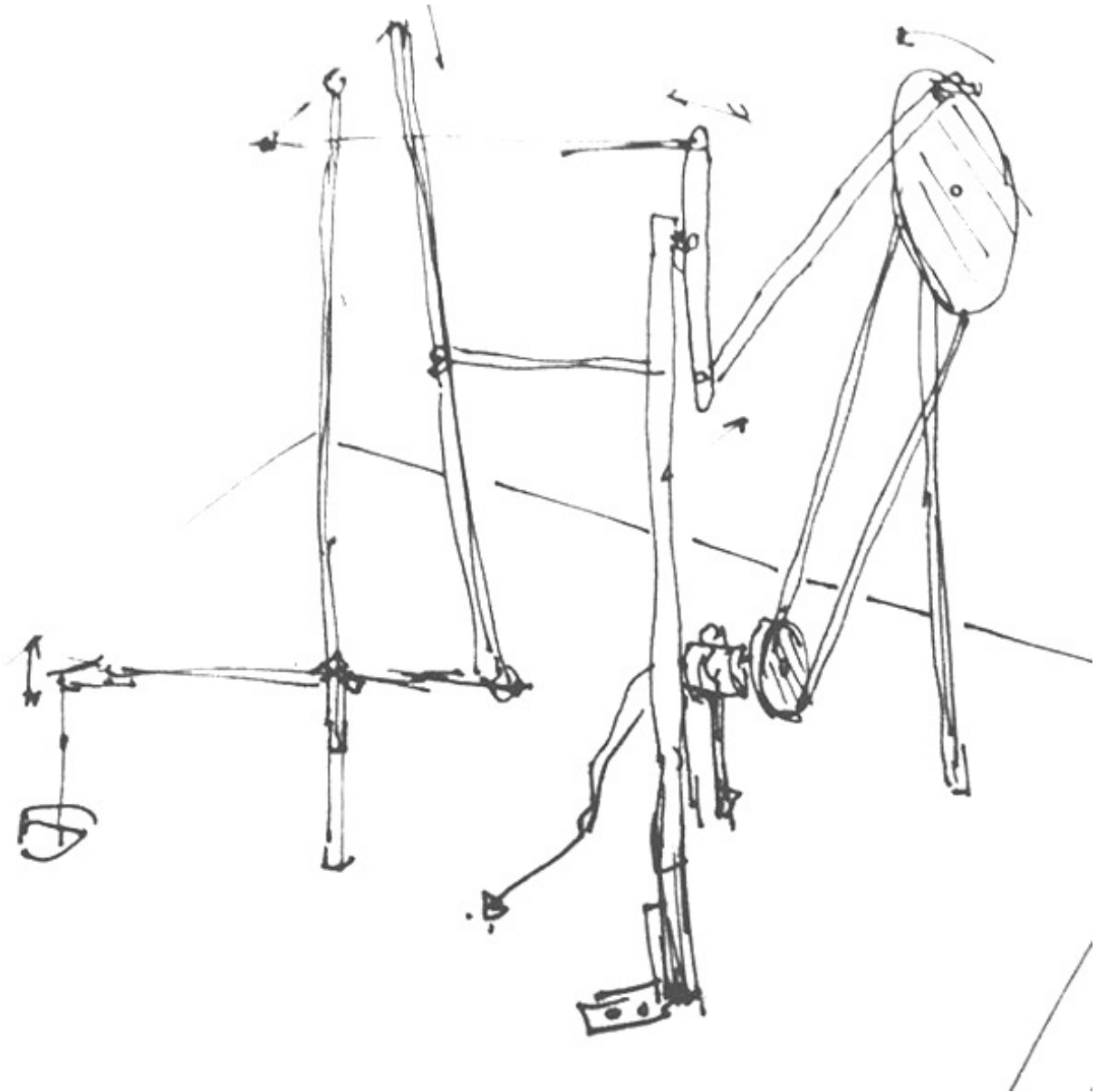
<https://vimeo.com/225826267>

<https://vimeo.com/175271960>

Additional Information:

when they don't know what to say
and have completely given up on the play
just like a finger they lift the machine
and the spectators are satisfied
(Aristophanes, *Thesmophoriazusae*, 411 BC)

The machine Aristophanes is writing about here was a crane used to turn an actor into a god by flying him on to the stage. This theatrical cyborg was used to tidy up narrative loose ends. Now in the early 21st Century the finger has become the primary machine interface by which we are all becoming cyborg gods. Machine 18 plays a key role in defining the *Breaking Machine* in chapter 1 and in investigating the auditory symptoms of breakdown in Chapter 2.



Machine 19

Appearances:

Love Machines, Minorities Gallery, Colchester, 2017 (solo)

A Grand Exposition, Talbot Mill, Manchester, 2017

Materials:

B&W TV, Formica, AV to UHF translator, AV security camera, beat responsive sound detector, stainless steel, broom handles.

Breakdowns Exhibited:

As part of its function, the TV displays an intermittent image in response to sound. As such it appears to be going through a breakdown in signal.

Repairs:

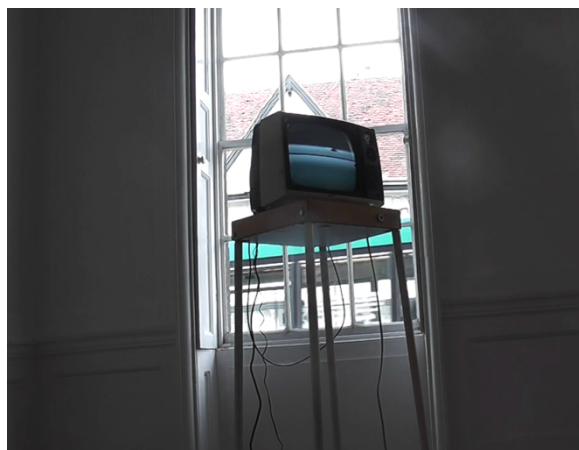
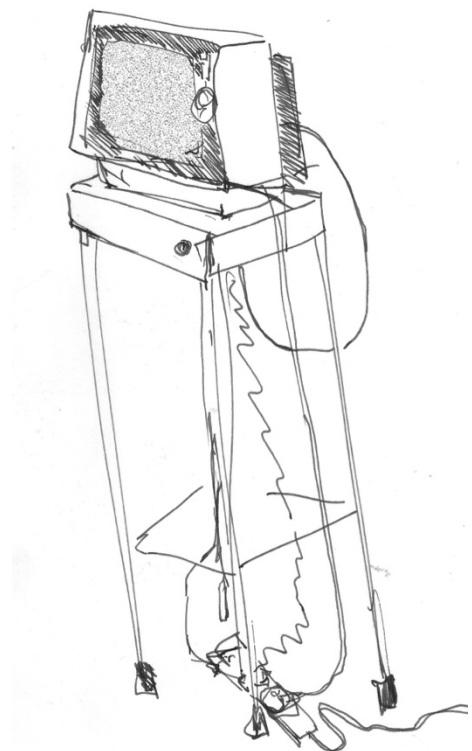
None.

Links:

<https://www.instagram.com/p/BR02m0UAjBr/?taken-by=rotagavinii>

Additional Information:

Once visitors recognised that the machine reacted to sound they made attempts to keep it 'functioning' by shouting, clapping or stamping their feet. In this way, the machine elicited a reaction from human components of the exhibition.



Machine 20

Appearances:

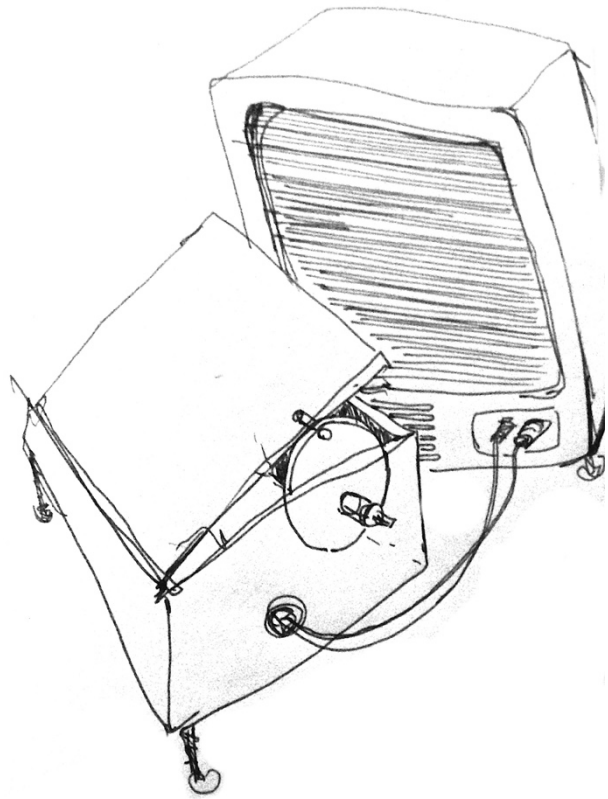
Love Machines, Minorities
Gallery, Colchester, 2017

Materials:

Sewing box, TV, motor,
plywood, microphone, camera

Breakdowns Exhibited:

During its exhibition, the cam assembly used to lift the sewing box lid repeatedly failed due to excessive play. Prior to failure the lid movement was increasingly jerky and erratic. Eventually the cam (originally made from a cd) was replaced with plywood.



Repairs:

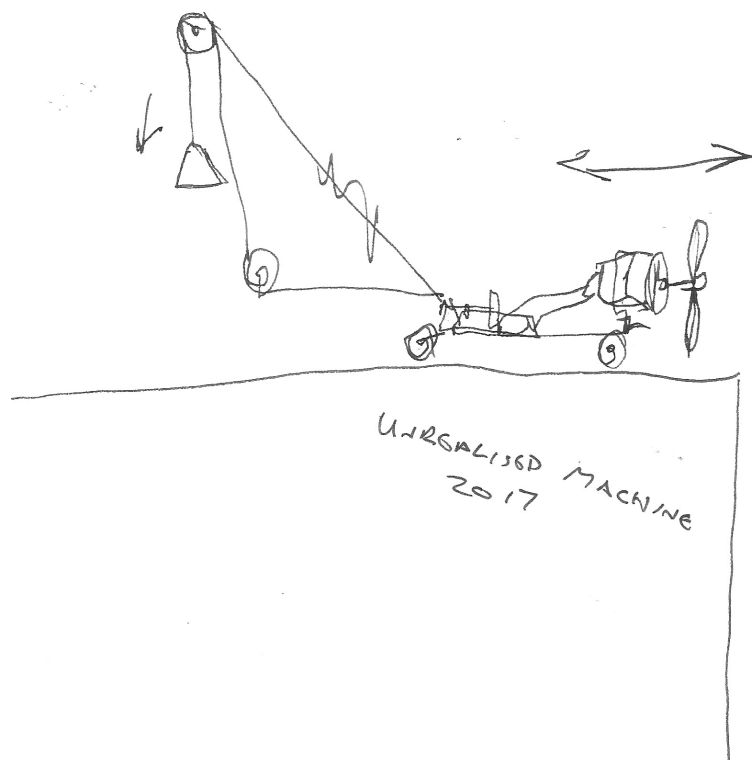
See above.

Links:

<https://vimeo.com/225672514>

Additional Information:

In function the machine emits a low moan as the lid rises, this is caused by feedback. Feedback is a form of auditory breakdown caused when the microphone picks up its own signal from the speakers. This creates an infinite loop which builds to a high-pitched note. In the case of Machine 20 the loop is cut by the closing lid before it reaches this crescendo. Machine 20 approaches and recedes from breakdown like the internally conflicted robot of Asimov's *Runaround* (Asimov, 1950:44)



Machine 22

Appearances:

Love Machines, Minorities
Gallery, Colchester, 2017

Materials:

1960s suitcase,
aluminium pole, motor,
elastic band, plywood.

Breakdowns Exhibited:

Seize, Play, Cutting
Loose

Repairs:

None

:



Machine 23

Appearances:

Love Machines, Minorities Gallery,
Colchester, 2017

Materials:

1950s magic set, Perspex, meccano,
dansette legs

Breakdowns Exhibited:

Play and cutting loose in the cam
mechanism.

Repairs:

This machine required daily reassembly so much so that it became part of the morning set up of the show.

Links:

<https://www.instagram.com/p/BR02m0UAjBr/?taken-by=rotagavinii>



Machine 24

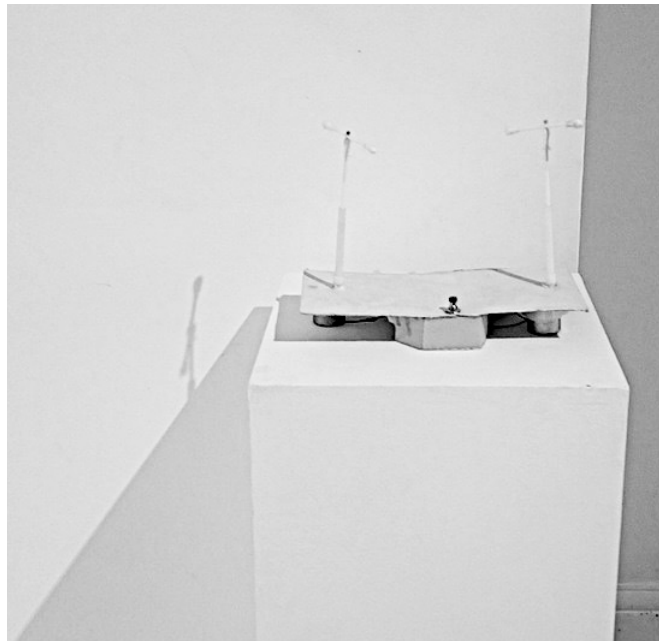
Appearances:

Denis ex Machina, CANAL,
London, 2017

Love Machines, Minorities
Gallery, Colchester, 2017

Materials:

Card, push-to-make switch,
cotton buds thread, stepped
motors



Breakdowns Exhibited:

Due to seizing the motors would run at varying speeds causing the two *propellers* to tug at each other. Eventually the right-hand motor ceased to work.

Repairs:

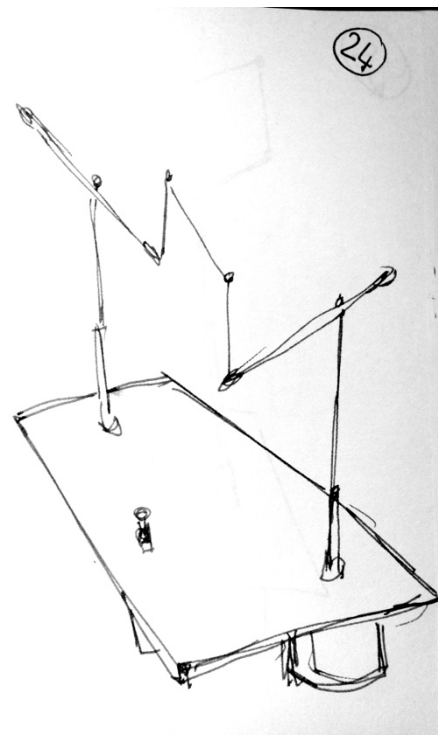
Originally, the cotton bud propellers
were attached by cotton thread
however, by Love Machines the thread
had been lost and was not replaced

Links:

<https://vimeo.com/225832197>

Additional Information:

Machine 24 only functioned while its
push-to-make button was depressed,
usually by a finger. When the right-
hand motor ceased to work, the
machine highlighted how function and
breakdown define each other.



Machine 25

Appearances:

Love Machines, Minorities
Gallery, Colchester, 2017

Materials:

Suitcase, projector, table
football player

Breakdowns Exhibited:

Seizes in the drive belt
indicated by sporadic
movement in the footballer.

Cutting loose in the internal drive mechanism of the projector lead to a change in
auditory symptoms and a cessation of movement in the footballer.

Repairs:

The projector spool was continually modified as the rubber drive belt stretched and
twisted. Eventually the projector broke an internal drive belt and could not be
repaired. It was left on display in the condition for the remainder of the exhibition.

Links:

<https://vimeo.com/225672896>



Machine 26 (The God Machine)

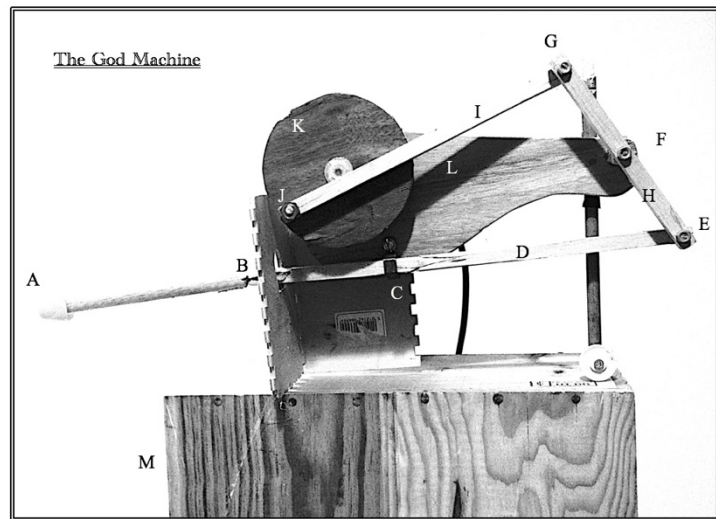
Appearances:

Denis ex Machina,
CANAL Gallery, London,
2016 (solo)

Love Machines, Minorities
Galleries, Colchester,
2017 (solo)

Materials:

Thimble, motor, found
mechanism



Breakdowns Exhibited:

While forming a part of *Machine 35* this mechanism worked its way off its plinth and fell to the floor. Smashed into several pieces it was then remade as part of *Machine 35a*

Repairs:

During its lifetime, this mechanism suffered a number of falls leading to repairs to the cam shaft at points D and B. It was also prone to play leading to catastrophic seizes usually at points J and B.

Links:

<https://vimeo.com/175271960>

Additional Information:

Machine 26 also formed a part of the video-machine *Deus (Machine 29)*, and early version of *Machine 9* and *Machine 35*

Machine 27

Appearances:

Love Machines, Minorities Galleries, Colchester, 2017 (solo)

Materials:

Tape player, goldfish bowl, fur, plastic rods, wooden toy, elastic bands, chain

Breakdowns Exhibited:

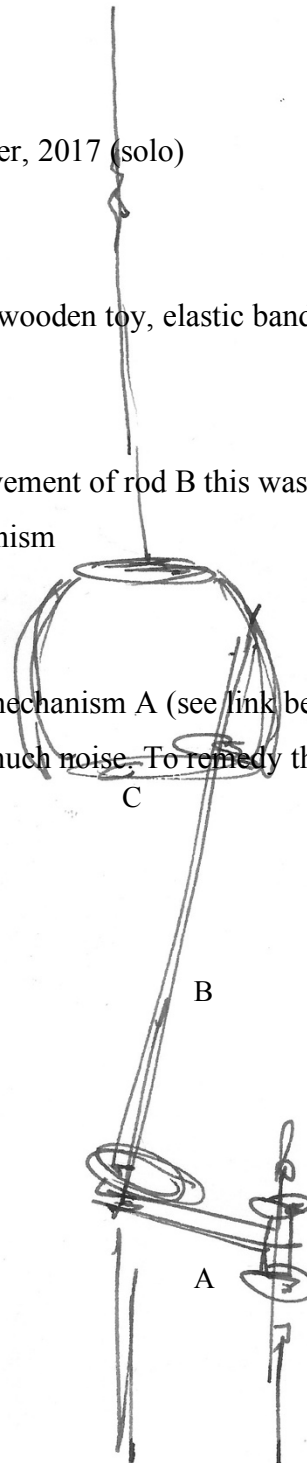
Seizes in the belt drive A led to sporadic movement of rod B this was further exaggerated by play in all parts of the mechanism

Repairs:

Regular repairs were made to the belt drive mechanism A (see link below). Also initially rod B and fishbowl C made far too much noise. To remedy this, pieces of fur were glued to the rime of C

Links:

<https://vimeo.com/226719682>



Additional Information:

Time for another description. I would tell you to close your eyes and picture it but, well...This work is heard first before you see it, a squeaking, rattling, grating thing. A primitive pulley made from bobbins, a rubber band and a cardboard reel is elevated about 10cm from the surface of another record player, this time sat on the floor. Another rod, this time long, white and plastic projects upwards nearly two metres into the gallery space from the centre of the cardboard reel. Towards its tip, as it enters into an upturned (and faux-fur-lined) fishbowl hung from the ceiling with monofilament, the white of the rod gives way to a vivid pink where it has been dyed. As the rod quivers to the motion of the reel below, it flutters around within the fishbowl, occasionally smacking against the fur inside the bowl, occasionally against the plastic. The motor whirs, the rubber band squeals, the rod picks, plods, rests against the bowl.

(Balkan 2017)



Machine 28 (Self-Regarding Machine)

Appearances:

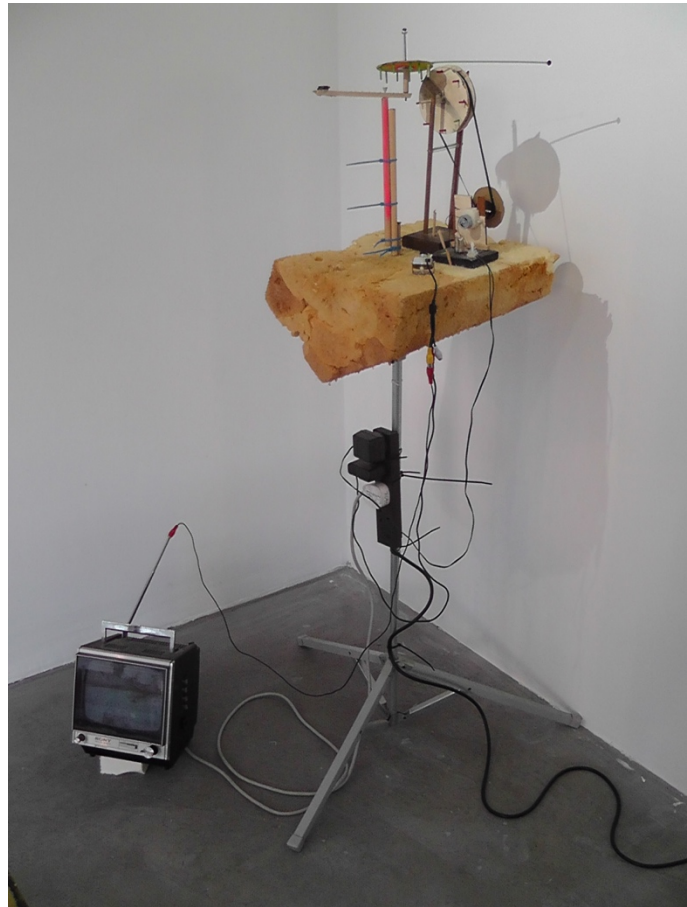
Denis ex Machina, CANAL
Gallery, London, 2016 (solo)
Love Machines, Minorities
Galleries, Colchester, 2017
(solo)

Materials:

Expanding foam, screen
tripod, Sony solid state
analog TV, digital camera,
knitting needles, dowel,
plywood, card, motor.

Breakdowns Exhibited:

Play in the wheels often
leads to the belt being unshipped. There is also a breakdown of signal between the
video formats of the camera and TV, this is discussed in Chapter 2.



Repairs:

The belt drive often needed repairing during *Denis ex Machina* and *Love Machines*
(video below)

Links:

<https://vimeo.com/225826424>

<https://vimeo.com/206983174>

Additional Information:

Machine 29 (Deus)

Appearances:

Love Machines,
 Minorities Galleries,
 Colchester, 2017
 (solo)
Our Friends Electric,
 Quad, Derby, 2017

Materials:

Machine 26, digital
 video camera, TV, artist.



Breakdowns Exhibited:

The sound of this *video-machine* reveals both the function of *Machine 16* and its impending breakdown. The off-screen creaking of joints is accompanied by a weakening in the finger's (b) impacts on the nose (a).

Repairs:

See *Machine 16*

Links:

<https://vimeo.com/191867388>

Additional Information:

Machine 28 is discussed in detail in Chapter 3 in reference to breakdown's role in unbalancing the Vitruvian model.

Machine 30

Appearances:

Love Machines, Minorities Galleries, Colchester, 2017 (solo)

Materials:

Foil covered cake base, cork, elastic, thimble, mirror, aluminium rods, motor.

Breakdowns Exhibited:

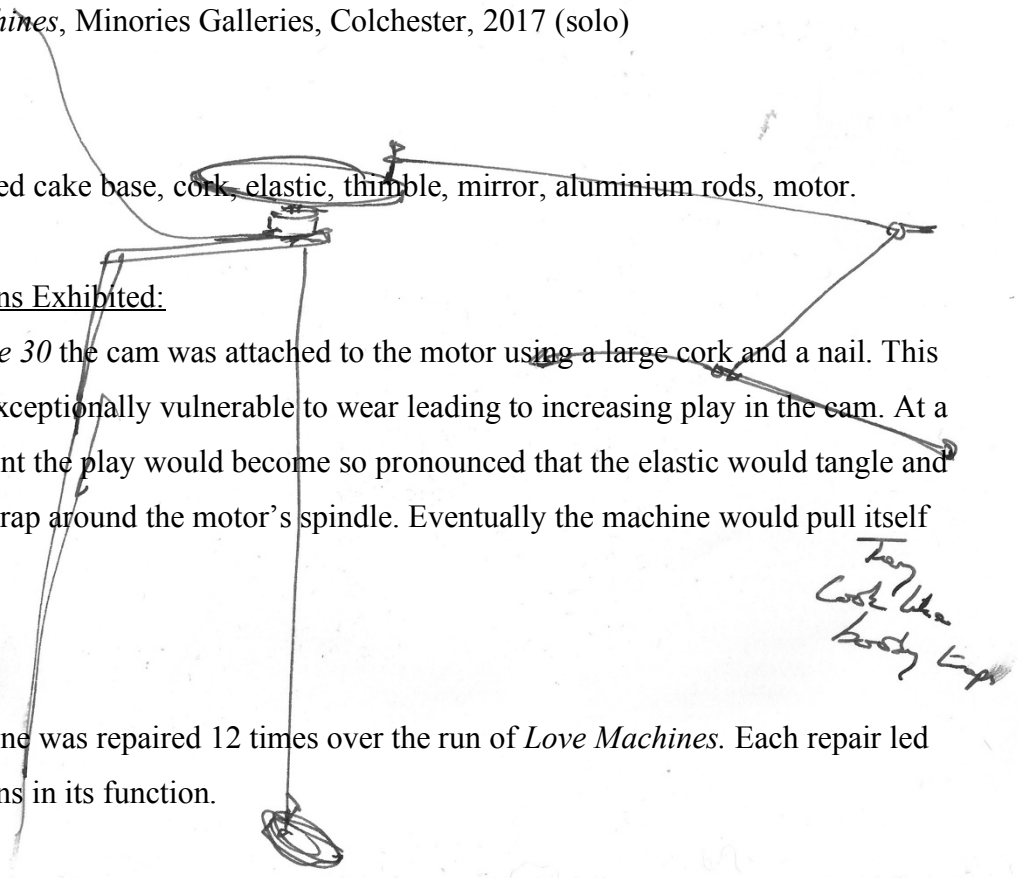
In *Machine 30* the cam was attached to the motor using a large cork and a nail. This link was exceptionally vulnerable to wear leading to increasing play in the cam. At a certain point the play would become so pronounced that the elastic would tangle and begin to wrap around the motor's spindle. Eventually the machine would pull itself apart.

Repairs:

The machine was repaired 12 times over the run of *Love Machines*. Each repair led to variations in its function.

Links:

<https://vimeo.com/225672705>



Machine 31

Appearances:

Love Machines, Minorities Galleries, Colchester, 2017 (solo)

Materials:

Circuit board, turntable, brass rod, cake decoration, Perspex dome, tripod

Breakdowns Exhibited:

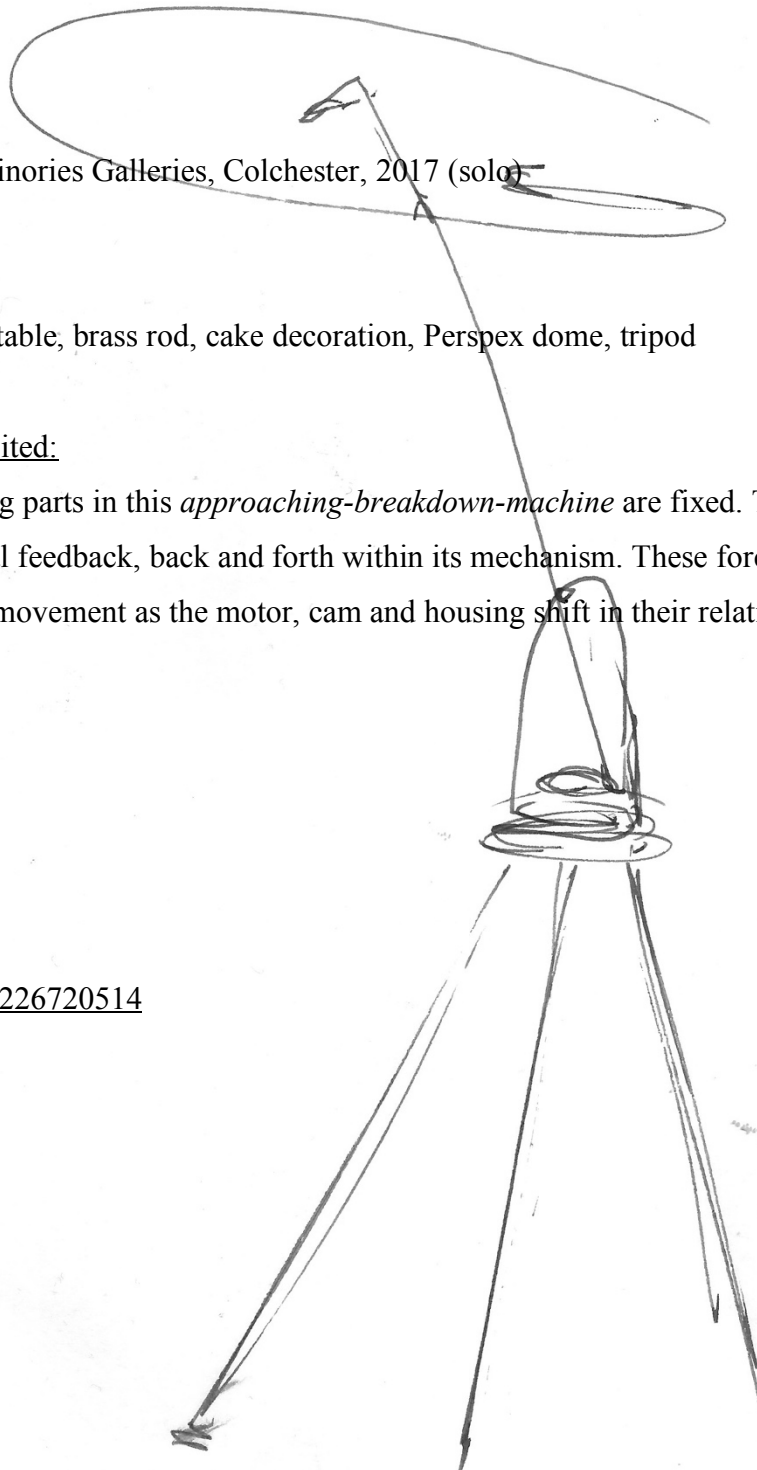
None of the moving parts in this *approaching-breakdown-machine* are fixed. This leads to mechanical feedback, back and forth within its mechanism. These forces cause variation in movement as the motor, cam and housing shift in their relative positions.

Repairs:

None

Links:

<https://vimeo.com/226720514>



Machine 32

Appearances:

Love Machines, Minorities
Galleries, Colchester, 2017
(solo)

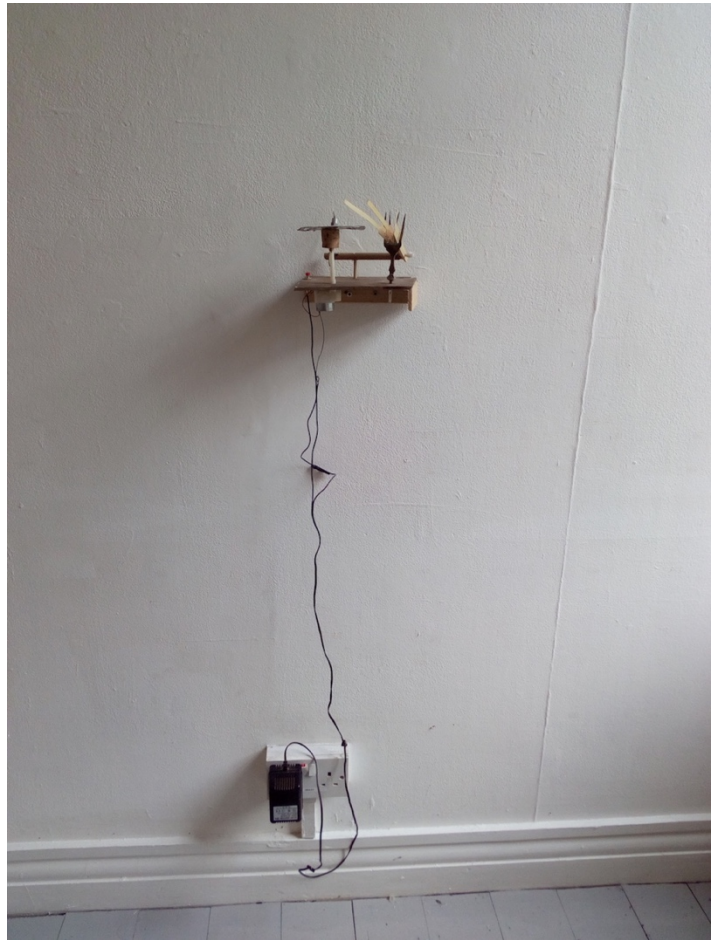
Materials:

“The Love Bug”

Viewmaster slide disc, cork,
fork, fan struts, stepped
motor, push-to-make
switch.

Breakdowns Exhibited:

This *approaching-breakdown-machine* displays both *play* and significant *seizes* in its mechanism. However, in this case the *play* in both the materials and joints are instrumental in allowing it to retain its level of function.



Repairs:

None.

Links:

<https://vimeo.com/226720868>

Additional Information:

Installed as a replacement for *Machine 33* after its failure. *Machine 32* is interactive in the same mode as *Machine 22*.

Machine 33

Appearances:

Love Machines, Minorities
Galleries, Colchester, 2017
(solo)

Materials:

Portable tv set, motor,
charger, ping pong ball,
map pins tape, card.

Breakdowns Exhibited:

This *breaking-machine*
functioned by disconnecting
and reconnecting the power
to a hand held tv set.
Eventually, however, the
motor tangled in the TV
set's power cable and tore it
free.



Repairs:

This machine required regular *fiddling* to keep it functioning as it relied on the ping pong ball catching and releasing a broken wire. The mechanism lasted a week before it was replaced by *Machine 32*.

Links:

<https://vimeo.com/225672445>

Additional Information:

When functioning *Machine 33* worked more like a *video-machine* than an *approaching-breakdown-machine* in rendering a gif-like experience of repeating breakdown and refunction.

Machine 34

Appearances:

Love Machines, Minorities
Galleries, Colchester, 2017
(solo)

Materials:

1960s Pifco Fan, TV DVD
Combo, headphones.

Breakdowns Exhibited:

This video machine presented a 20-minute looped video of a fan seizing. As its motor overheated heat was transmitted to the fan's bearing causing them to expand and seize. This was at first sporadic leading to juddering but eventually led to failure. At which point the fan emitted a buzzing whine before being looped back to function.



Repairs:

None

Links:

<https://vimeo.com/176871549>

Machine 35 & 35a

Appearances:

Love Machines, Minorities Galleries,
Colchester, 2017 (solo)

Materials:

Screen, Projector, Machine 26, crate,
camping chair, tripod

Breakdowns Exhibited:

See *Machine 26*

Repairs:

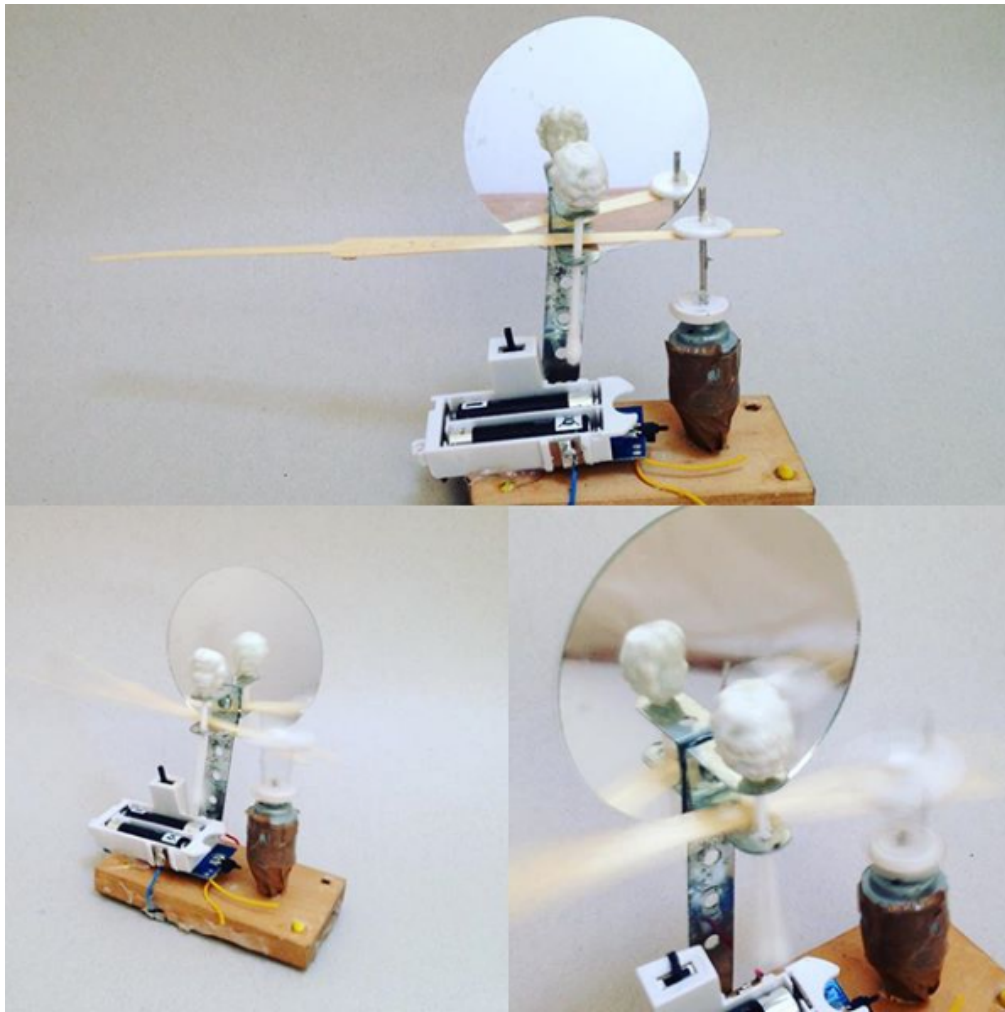
This machine was remade into *Machine 35a* part way through *Love Machines*

Links:

<https://vimeo.com/226719516>



Machine 36



Appearances:

Denis ex Machina, CANAL Gallery, London, 2016 (solo)

Love Machines, Minorities Galleries, Colchester, 2017 (solo)

Materials:

Sound sensor, motor, fan strut, mirror, cotton buds, porcelain head.

Breakdowns Exhibited:

The mechanism is subject to seizes and vibration which causes the whole piece to move so much it must be tethered. Repeated impacts on the mirror first caused it to crack and then a small piece to detach. The smell of overheating, a precursor to burnout can be detected when the machine is most active.

Repairs:

A small piece of tape has been applied to the back of the mirror to strengthen it.

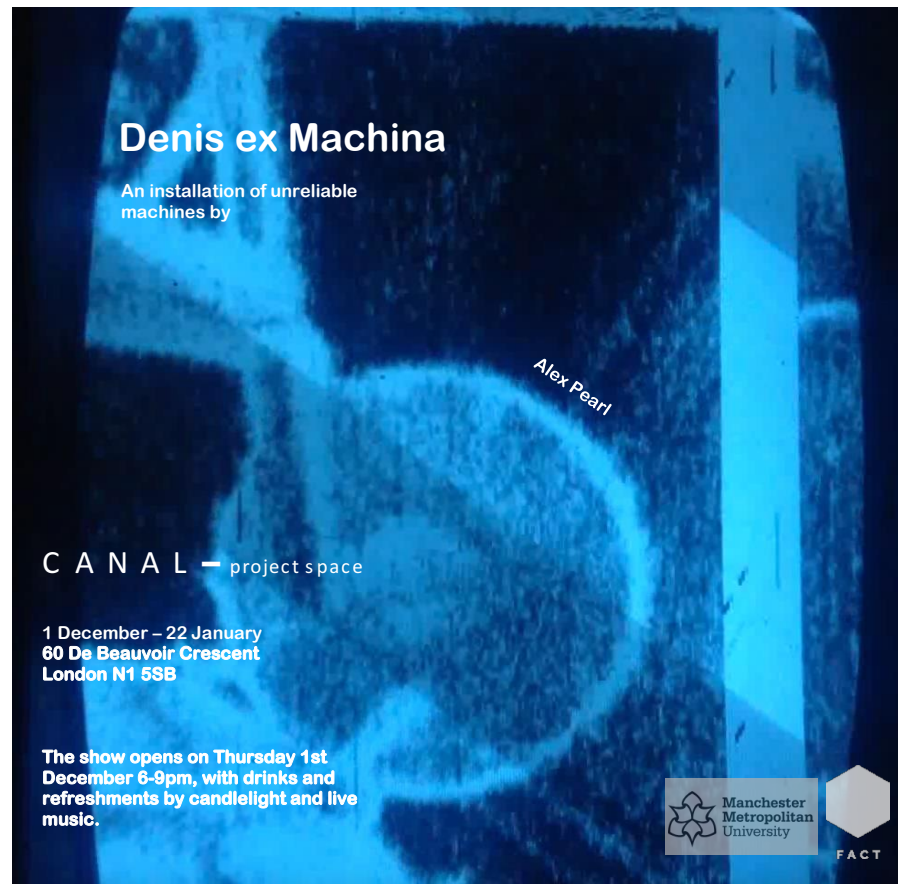


Links:

<https://vimeo.com/167910078>

EXHIBITION DOCUMENTATION

Denis Ex Machina – 1st December- 22 January, 2016, CANAL Project Space,
London



Introductory Text

The Deus ex Machina was a theatrical apparatus first used by Aeschylus and Euripides. Although it has become a literary device it originally had an entirely mechanical form. It usually took the shape of a crane (Mechane) or other mechanical device used to bring a god onto the stage. Deployed to dig the story out of a plot hole, the machina made a conscious break in the narrative and, to create a god, a theatrical cyborg was brought to life.

The Deus ex Machina relies upon the smooth operation of its component parts. But what happens when things break down?

For this exhibition, Alex Pearl has constructed a series of strangely human machines which exist on the cusp of function and breakdown.

Installation Images:





Documentary Video:

<https://vimeo.com/193877816>

Additional works not listed above:

Lift, super8 film, motor, Meccano, 2016.

While researching machines that help humans become god-like I kept returning to the ski lift and cable car. This machine was an attempt (without research) to understand how such a machine might work. It is made using 1950s cine film footage of a trip around Europe taken by my grandparents and father. It is a machine under constant strain where gentle movement is suddenly replaced with violent action and uncomfortable sounds. It is easy to anthropomorphise the cotton buds as they are carried around.



ISSUE 1-5, 2016, limited edition publications.

ISSUE is an ongoing series of limited edition bound publications. They have been assembled,

much like the machines of *Breakdown*, from available material and much (though not all) of their content relates to my current research. The processes involved in making these books/zines, binding, printing and pagination, create new relationships and juxtapositions of the material as do the inevitable breakdowns of mis-pagination, inversion, poor registration and machine failure that plague my efforts. Each ISSUE is produced in small editions of 5-7 with each displaying small to significant variation. The complete range can be viewed here:

<http://www.alexpearl.co.uk/page19.htm>



God Machines, Unique prints on 1930s Airmail Paper.

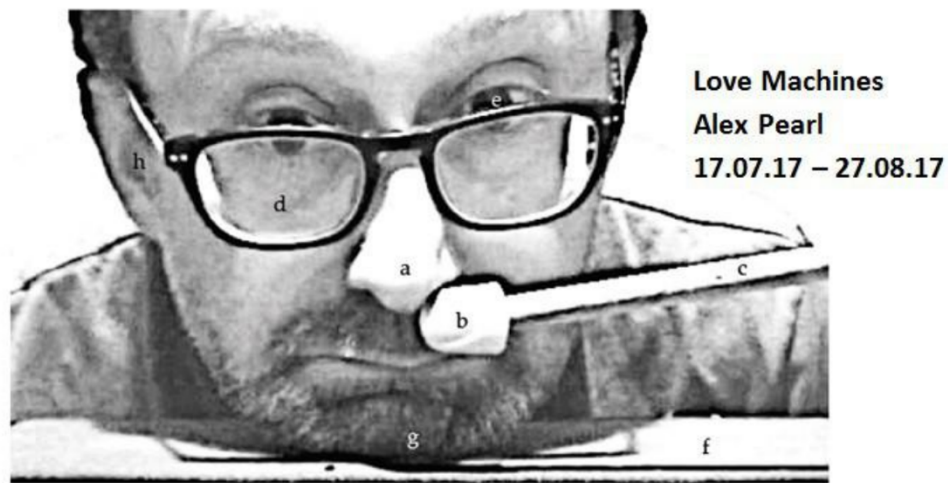
A series of unique prints made with a typewriter, carbon paper and a malfunctioning inkjet printer. Their whimsical content varies hugely ranging from the writing of 1930s aviator Antoine de Saint Exupery, via the story of Annie Taylor, the first person to survive a fall over Niagara in a barrel, to the workings of mechanical linkages.

Music Machines, 2016, motor, adapted music box.

This duet is made by the varying motor speeds and degrees of damage applied to two music box mechanisms which writhe organically in their plastic containers. Their song is simultaneously variable and repetitive and builds a relationship in the space.



Love Machines, 17 June - 27 August 2017, Minorities Gallery, Colchester



Gallery Information

The machines and videos displayed in *Love Machines* have largely been conceived and constructed in FACTLab, an open facility developed by FACT (Foundation for Art and Creative Technology in Liverpool) to allow artists and technologists to explore their technoerotic fascinations. Visitors to the exhibition are invited to approach the machines consciously and cautiously, and consider their relationship to them. Through sound, vision, movement and touch the machines will also develop their own relationship with the space they inhabit and any body that approaches them. As they approach breakdown they will be repaired, reconfigured and replaced. This act will be a performative element of the exhibition but not quite a performance.

Alex Pearl is interested in the way we relate to machines, particularly in the way we relate to them when they break down. This area of research feels increasingly relevant as our interaction with machines increases daily. We rely on machines for many of our daily tasks – from drying hair to toasting bread, moving us around to documenting thoughts, capturing images and sharing almost everything. We probably engage more with machines than we do with other human-beings. We are so continuously contiguous with our phones that we are virtually cyborgs. Science Fiction is very close to becoming a reality.

Our quotidian exchanges with machines are usually off-hand and casual. If we are familiar with them we use them almost without thinking. But what happens when machines break down? How does our relationship with them alter? This question is central to Alex's work. The machines he makes often do break down as they have an increased tendency towards failure. This is achieved through bad workmanship (deliberate or otherwise) or by the construction of mechanisms that exist on the edge of function.

When a machine breaks down we pay a lot more attention to it – feelings of frustration or anger are sometimes vented on it, and we often act as if the machine is sentient and has chosen to malfunction for malicious reasons. These moments of anthropomorphism can induce us to shout or swear at them, call them names, or perhaps (in the famous scene in *Fawlty Towers* where Basil's car breaks down) thrash them with a branch.

The humorous aspect of this behaviour has not gone unnoticed by Alex, and he exploits the ridiculousness of our relationship with, and attitude towards these amalgamations of dumb materials to produce works that highlight the emotional. There is also a suggestion that there is a deeper relationship at work here, a material exchange between machine and human, a type of love. In a process akin to our search for love, Alex's machines draw us in with the thrill of anticipation as we wait for something momentous to occur, until we begin to understand that maybe nothing will take place, and walk away bemused but maybe also amused.

Alex says about his work: "Even in 1932, mechanologists like Jacques Lafitte were seeking to break down the perceived barrier between what was considered human and what was considered machine. Of course, robots had already been invented and were often (like Fritz Lang's Maria in *Metropolis*) running amok, tearing down the human world. Now, while we continue to be anxious about the machine, our intimacies with metal and silicon have never been greater. We love (and hate) machines. The relationships explored in *Love Machines* are a little less violent than much Science Fiction but no less intimate. Hopefully in this exhibition there is a

level of (self)love in the material exchanges experienced by the viewer, the artist and the machines.”

(Clayton, 2017)

Installation shots:











Documentary Videos:

<https://vimeo.com/226720868>

<https://vimeo.com/226720514>

<https://vimeo.com/226719682>

<https://vimeo.com/226719516>

<https://vimeo.com/225832197>

<https://vimeo.com/225826424>

<https://vimeo.com/225826267>

<https://vimeo.com/225672984>

<https://vimeo.com/225672896>

<https://vimeo.com/225672705>

<https://vimeo.com/225672514>

<https://vimeo.com/225672445>

<https://vimeo.com/206983174>

Review:

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'Love Machines' is a selection of new works at the Minorities Galleries by **Alex Pearl** that have been made in partnership with FACTLab in Liverpool. These machines have seemingly been bricolaged from second-hand materials for the most part, and are largely automated to fulfil unproductive functions. A few of the machines respond to human presence and other ambient conditions; for example, a camera and television switch on when sound is detected. Other machines are self-contained in their operation, engaged in simple tasks such as raising and lowering a lever. Unsurprisingly, the sculptural qualities of the machines and subversion of found objects is as important as their operation. Even when the machine is asleep or dead, it continues to provoke a tactile interest.

Because of the ad hoc quality of these machines, feedback loops ultimately become confused cat's cradles that will sooner or later fall apart. Such a fate is not to be construed as a programmed outcome, however. These works are not fundamentally auto-destructive in the manner of Gustav Metzger or Jean Tinguely. Rather, mechanical failure betokens a relatively scant knowledge of construction techniques allied with a requirement to work with barely satisfactory materials at hand. When it breaks, the machine is possibly repairable and parts can be replaced, though whether it has the same function or even is the same machine is an open question. Some of Pearl's machines survived the duration of the exhibition, but not all.

If the thought often ascribed to Martin Heidegger that when a tool breaks we come to view its object qualities all the more consciously (though not more precisely) is true, then we might modify this reflection and suggest with Pearl's 'Love Machines' that mechanical breakdown doesn't so much serve to cast heightened attention on his machines as to provoke reflection on our own fragility. Indeed, in the homemade booklets accompanying the exhibition, the analogy between mechanical failure and neurological disruption becomes a core theme. Many aspects of culture and technology have implicitly taken machines as improving on human limitations, yet Pearl's exhibition is a salutary reminder that machines mirror human desires and so equally reflect distinctly human shortcomings. In this case, there is something veritably touching about 'Love Machines', as if we discover that it is possible not just to be bemused or fascinated by their Heath Robinson-like construction, but also to find ourselves caring about their precarious condition. ■

MATTHEW BOWMAN lectures at the University of Suffolk and Colchester School of Art.

